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Professor and Chairman

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The feasibility of employing instrumental, restrained, conscious dogs in acceleration studies on the centrifuge has been demonstrated. The leads from implanted sensors pass through the skin on the upper back and when not connected to signal conditioning equipment are placed in a pocket of a nylon jacket worn by the dog. Protection of the sensor leads, in addition to the jacket, is afforded by an inflated rubber tube placed about the dog's neck. Measurements of carotid artery flow, vena caval flow and aortic pressure have

20. been obtained during experimental sequences. The investigators felt that the primary effect of denervation was attenuation of peripheral resistance to rapid onset acceleration necessitating significantly higher heart rates and cardiac outputs for a given carotid flow and eye level blood pressure.

INTRODUCTION

Investigation of mammalian cardiovascular regulatory mechanisms have demonstrated the existence of both high pressure and low pressure receptor systems which provide information to the central regulatory centers concerning the hemodynamic status of the heart and circulation (1,2,3,6,7). In addition to the well known sinoaortic baroreceptor systems, there are intracardiac receptors located in the atria and in the ventricles which influence heart rate and peripheral vascular tone. When man is exposed to acceleration in excess of the 1 G experienced normally, the distribution of his circulating blood volume may be altered. The +Gz acceleration forces are particularly effective in pooling blood in dependent vascular beds, resulting in a diminution of blood flow to the brain and venous inflow to the heart from dependent vascular beds. The response of the cardiovascular system to this gravitational stress depends on afferent information received from both the high and low pressure receptor systems (4,5,8,9). Previous studies of the operation of these receptor mechanisms under increased acceleration loading have been primarily conducted under slowly developing G forces under specific levels of acceleration maintained for relatively brief periods. However, the aircrew in a high performance fighter aircraft is exposed to acceleration forces which are cyclic and rapidly changing in both magnitude and direction over relatively long periods of time. Information relating to response times, relative magnitude of response, specificity of response, and fatigue of response would

aid in the evaluation of aircrew performance in a rapidly changing +G environment as is encountered in modern fighter aircraft.

A. Three-Year Plan

The principal objective of the proposed three-year research plan was to investigate these factors in a conscious dog by assessing the contributions of the carotid sinus, the aortic arch, and the cardiac mechanoreceptor (baroreceptor) mechanisms to the maintenance of cerebral blood flow and venous inflow to the heart during exposure to the +Gz acceleration profiles simulating high performance jet aircraft air combat maneuvers. The original investigation was designed to (1) characterize the normal cardiovascular responses to cyclic +Gz exposure on the centrifuge in terms of carotid blood flow, head-level arterial blood pressure, inferior vena caval flow, central venous and/or right atrial pressure, electrocardiograms, and arterial oxygen saturation in the adult dog and adult miniature swine; (2) analyze the specific contribution of each receptor area to the normal response through the study of experimental subjects with denervated receptor areas; (3) assess the possible effects of fatigue and habituation of the receptor on the magnitude of the cardiovascular "antigravity" responses; and (4) contrast responses obtained with and without an antigravity suit.

B. Sixteen-Month Performance Program

Various factors precluded the opportunity to complete the three-year plan as outlined in the work statement. The first year's effort called for data acquisition from 6 dogs, 3 with carotid sinus denervation and 3 with aortic baroreceptor denervation. Data were actually acquired from 5 dogs with the support received for the first 12-month effort. One dog served as a test case to develop acceleration levels, restraint systems, and data acquisition methods. Data were obtained from 1 dog with both carotid sinus and aortic baroreceptor denervation, from 2 dogs with carotid sinus denervation, and from all 5 dogs prior to any denervation. An antigravity suit was used on 2 dogs.

METHODS

This investigation required the degree of impairment in +Gz tolerance of instrumented dogs to be evaluated on the basis of flow and pressure responses to a set of acceleration profiles before and after cardiovascular areas were selectively denervated. By a procedure of surgical denervation of the carotid sinus receptor areas, a determination of the contribution of these specific areas to the maintenance of +Gz tolerance in the experimental subjects was made. The analysis of alteration in response time, magnitude of the response, specificity of the response, and fatigue of the remaining functional cardiovascular receptor areas was determined with and without an antigravity suit by assessing changes in carotid arterial flow, head-level arterial pressure, and venous inflow to the heart.

A. Instrumentation

Flow in the common carotid arteries and in the thoracic vena cava was measured by the use of chronically implanted flow probes. The phase difference between brief pulses of ultrasonic energy transmitted simultaneously from a pair of barium titanate crystals diagonally through the vessel was used as the basic measurement of volumetric blood flow (11). Calibration was conducted before implantation by forcing fluid through the probe lumen and measuring the output voltage from the meter as a function of the quantity of flow. Central arterial pressure was measured with a small button-type transducer implanted in the thoracic aorta. The techniques of implantation and calibration have been presented elsewhere (10).

B. Profiles

The acceleration profiles used in this study were developed from an actual ACM profile obtained from th- F-4-E fighter aircraft. This profile was scaled to the +Gz tolerance of the dog, using head-level arterial pressure and carotid blood flow as criteria for the determination of peripheral light loss (PLL) and central light loss (CLL). The profiles which were developed for conscious dogs are shown in Figure 1. These profiles consisted of (1) an ACM scaled to a peak of 4 + Gz, (2) a 5-cycle pulse to a peak level of 4 + Gz and a sustained 2.5 + Gz which was the mean level of the ACM profile.

Figure 2 illustrates the dog and the rider on the centrifuge. The tolerance and the availability of riders became a limiting factor in the data acquisition, so the requirement for the rider was eliminated

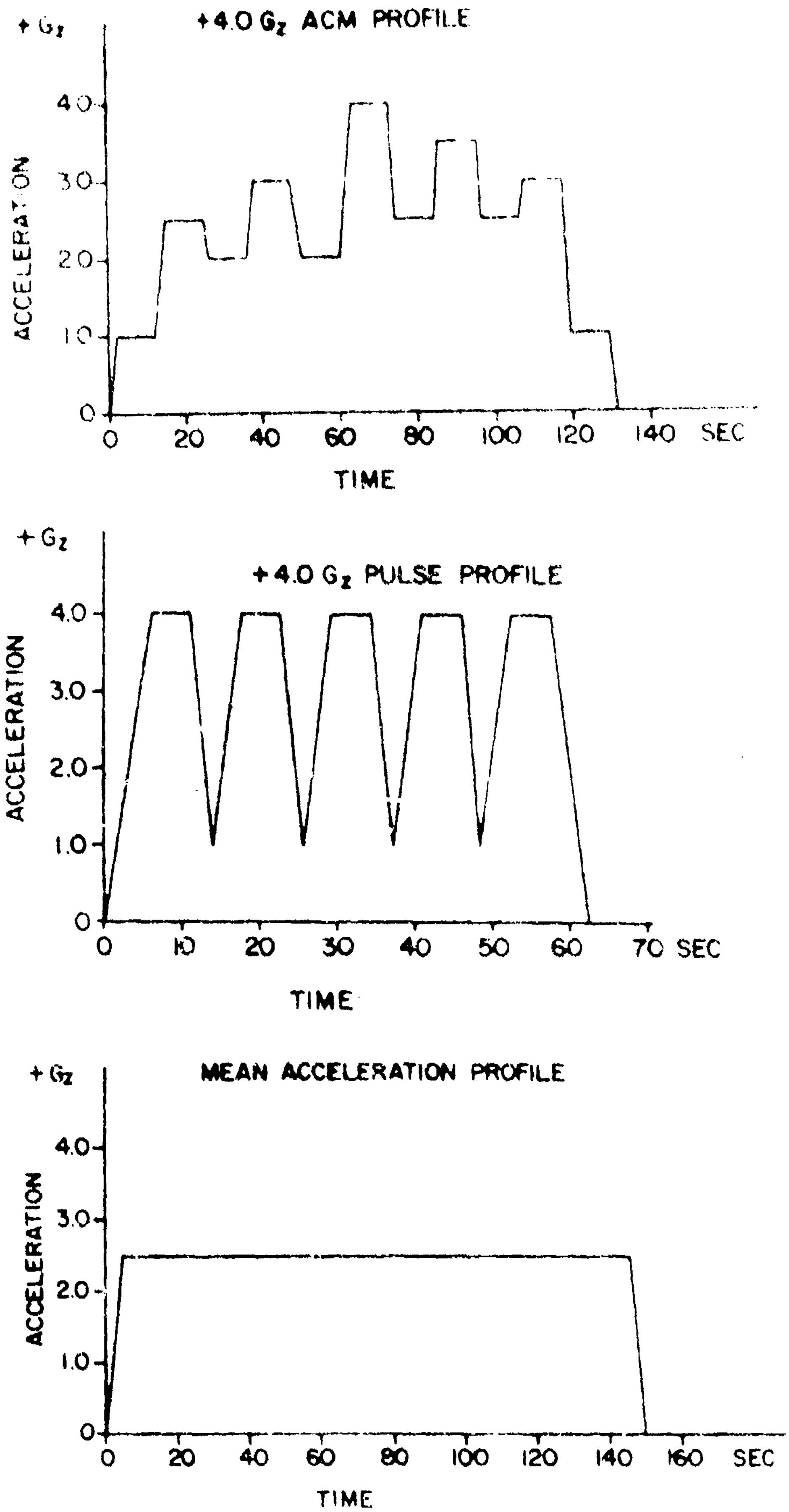
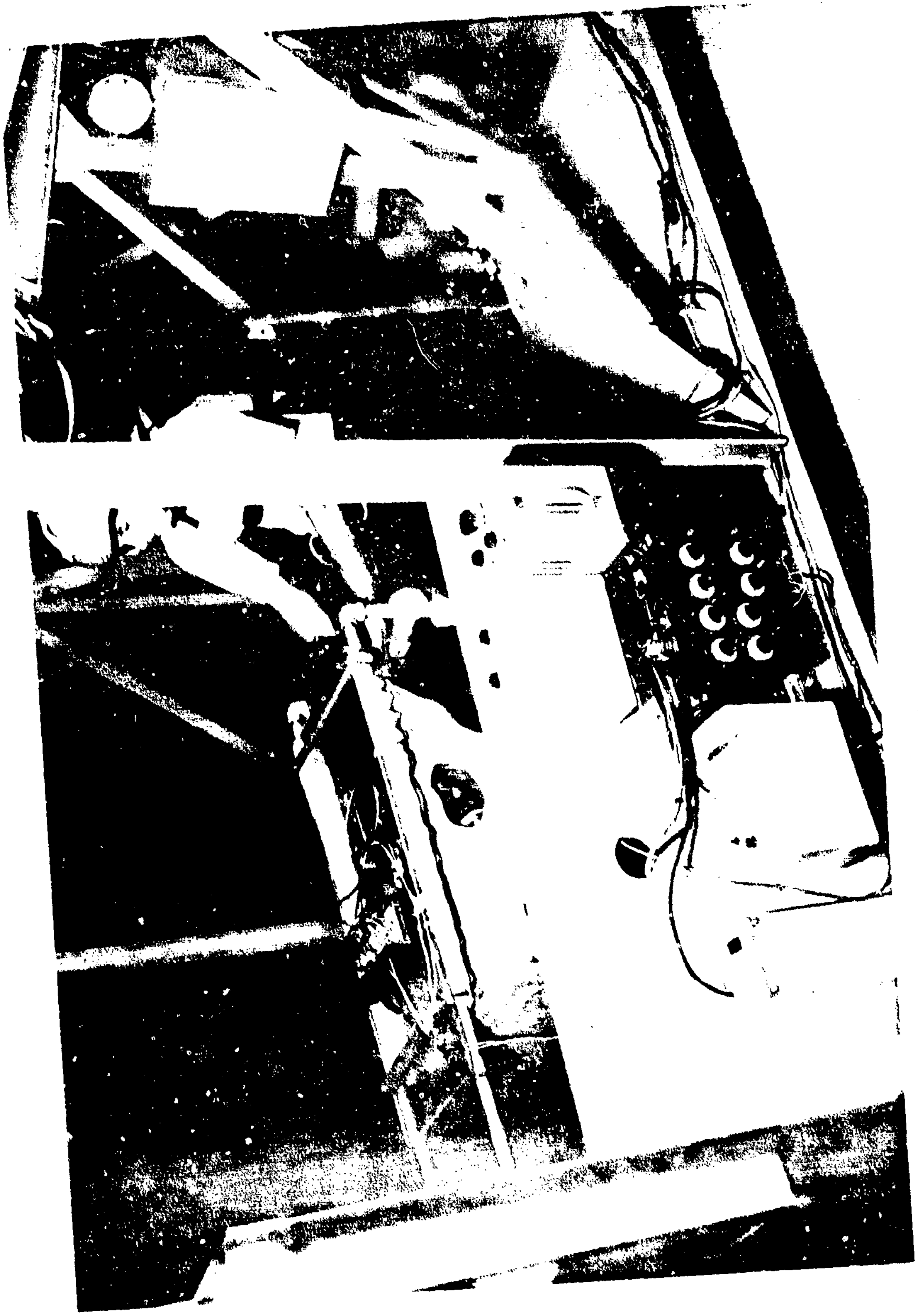

+4.0 G_z ACM PROFILE
+ G_z
ACCELERATION
4.0
3.0
2.0
1.0
0
0
20
40
60
80
100
120
140
SEC
TIME
+4.0 G_z PULSE PROFILE
+ G_z
ACCELERATION
4.0
3.0
2.0
1.0
0
0
10
20
30
40
50
60
70 SEC
TIME
MEAN ACCELERATION PROFILE
+ G_z
ACCELERATION
4.0
3.0
2.0
1.0
0
0
20
40
60
80
100
120
140
160
SEC
TIME

Figure 1



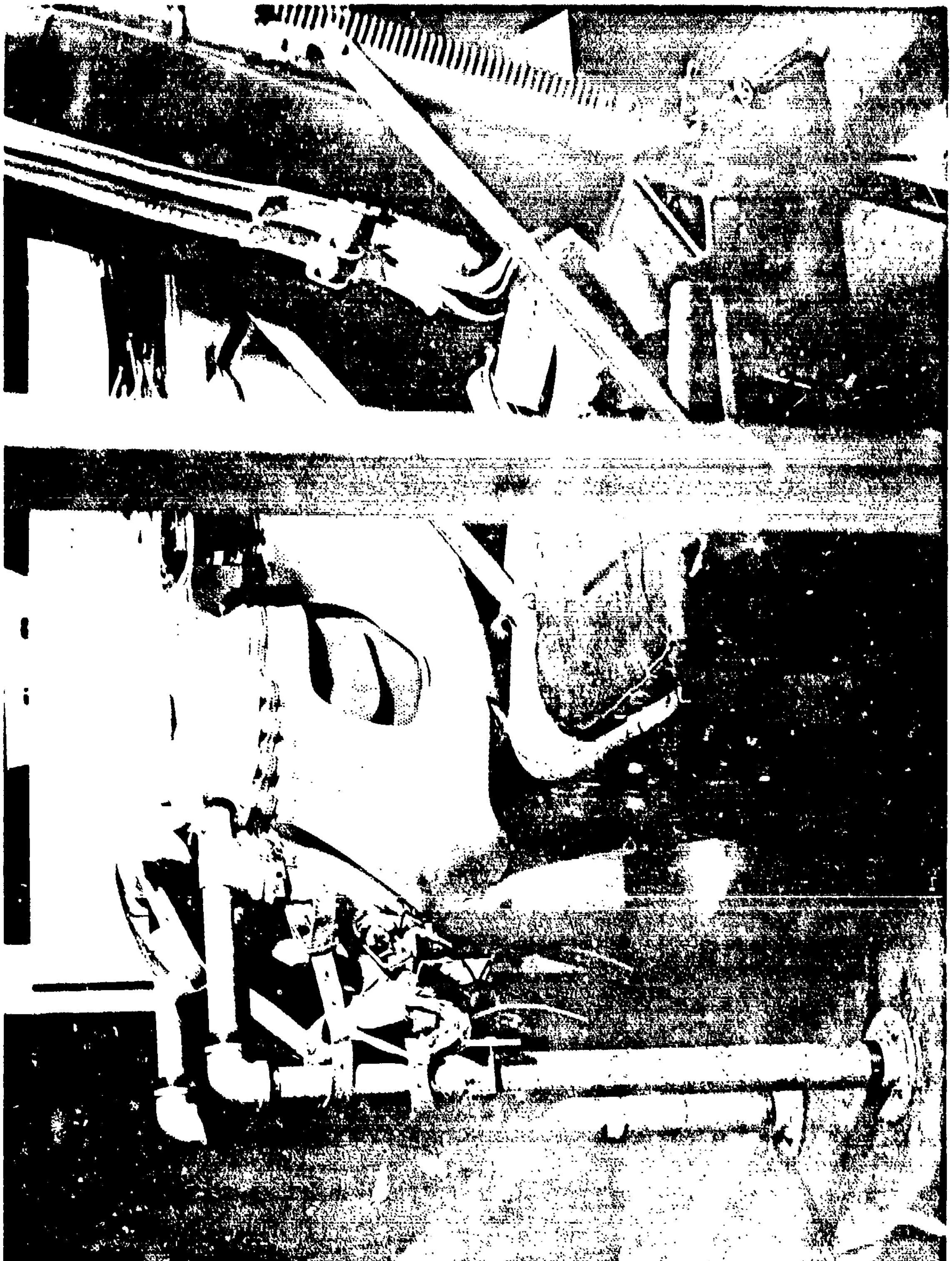


Figure 3

through the use of a special harness designed to restrain the dog's head (Fig. 3). With this improvement, fatiging of the dog became the limit on data acquisition.

C. Surgical Procedures

Instrumentation Implant

Surgical implantion of the blood flow and pressure sensors was performed in two successive procedures. The subjects were preoperatively medicated with 1/150 gr atropine sulfate and 75 mg Demerol. Anesthesia was induced with sodium thiamylal and the subjects were then intubated and anesthesia maintained, using halothane and oxygen. In the first procedure, blood flow sensors were placed bilaterally on the common carotid arteries and the sensor cables were led subcutaneously to the dorsum, medial to the scapulae. The subjects were given 600,000 units of aqueous penicillin G daily for 5 days postoperatively. After 7 to 10 days, the subjects were anesthetized again and a left thoracotomy was performed through the 5th intercostal space and a blood flow sensor was placed around the inferior vena cava. A solid state intravascular pressure transducer was then placed in the descending aorta at the level of the atrioventricular ring. These sensor cables were also led subcutaneously to the same region of the dorsum and the above postoperative regimen was performed.

After a sensor grow-in period of 21 to 30 days, the subjects were again anesthetized and the sensor connectors were exteriorized and placed in a pocket of the jacket worn by the experimental subject.

Denervation Procedures

The subjects were anesthetized and the carotid sinus exposed. The carotid sinus nerves were sectioned and the animals were allowed to recover for 5 to 7 days.

Aortic baroreceptor denervation was performed via a left thoracotomy through the 4th intercostal space. A recovery period of 14 to 21 days was allowed after aortic baroreceptor denervation.

D. Data Acquisition and Reduction

Preamplifiers for acceleration, pressure, and flow measurements were placed on the centrifuge near the location of the dog. The basic signals were conditioned and increased to an approximately 1-volt level. These signals were connected to a strip chart recorder through slip rings. Mean levels of the basic flow and pressure signal were obtained by electronic integration and displayed on the strip chart recorder. Data reduction consisted of charting mean levels of flow pressure and heart rate at particular points throughout the acceleration profiles. Analysis was made in terms of the percent change from control at each of the selected conditions of antigravity suit protection, denervation, and acceleration. The data were then analyzed for standard deviation and standard error of the mean.

E. Antigravity Protection

A modified abdominal bladder from a standard anti-G suit was used in conjunction with an Alar Products Inc. Automatic Pressure Regulating Anti-G Suit Valve to afford antigravity protection for the subjects. Figures 4, 5, and 6 illustrate the pressure responses of the above system

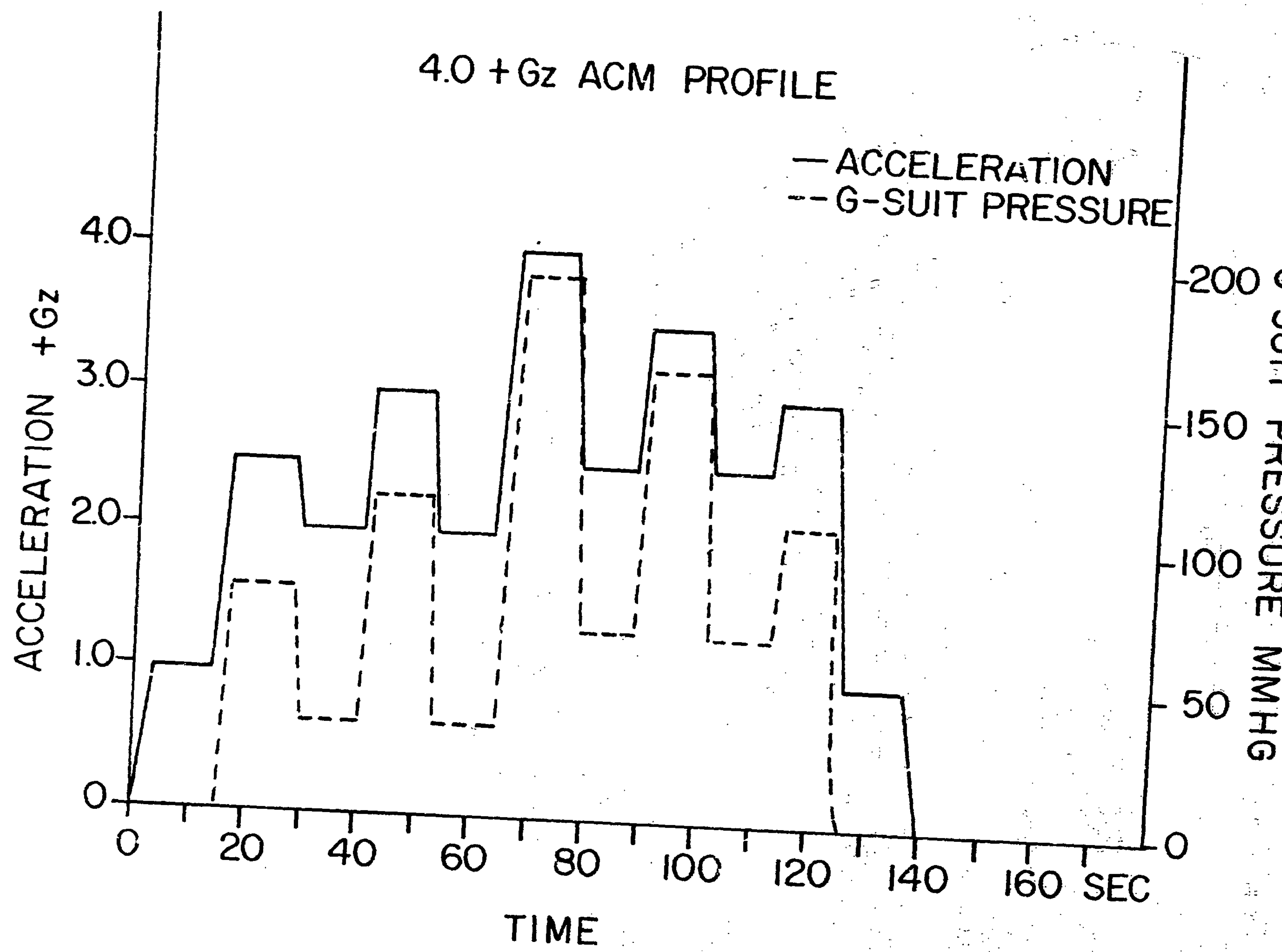

4.0 +Gz ACM PROFILE
— ACCELERATION
-- G-SUIT PRESSURE
ACCELERATION +Gz
0
1.0
2.0
3.0
4.0
G-SUIT PRESSURE MMHG
0
50
100
150
200
0
20
40
60
80
100
120
140
160 SEC
TIME

Figure 4

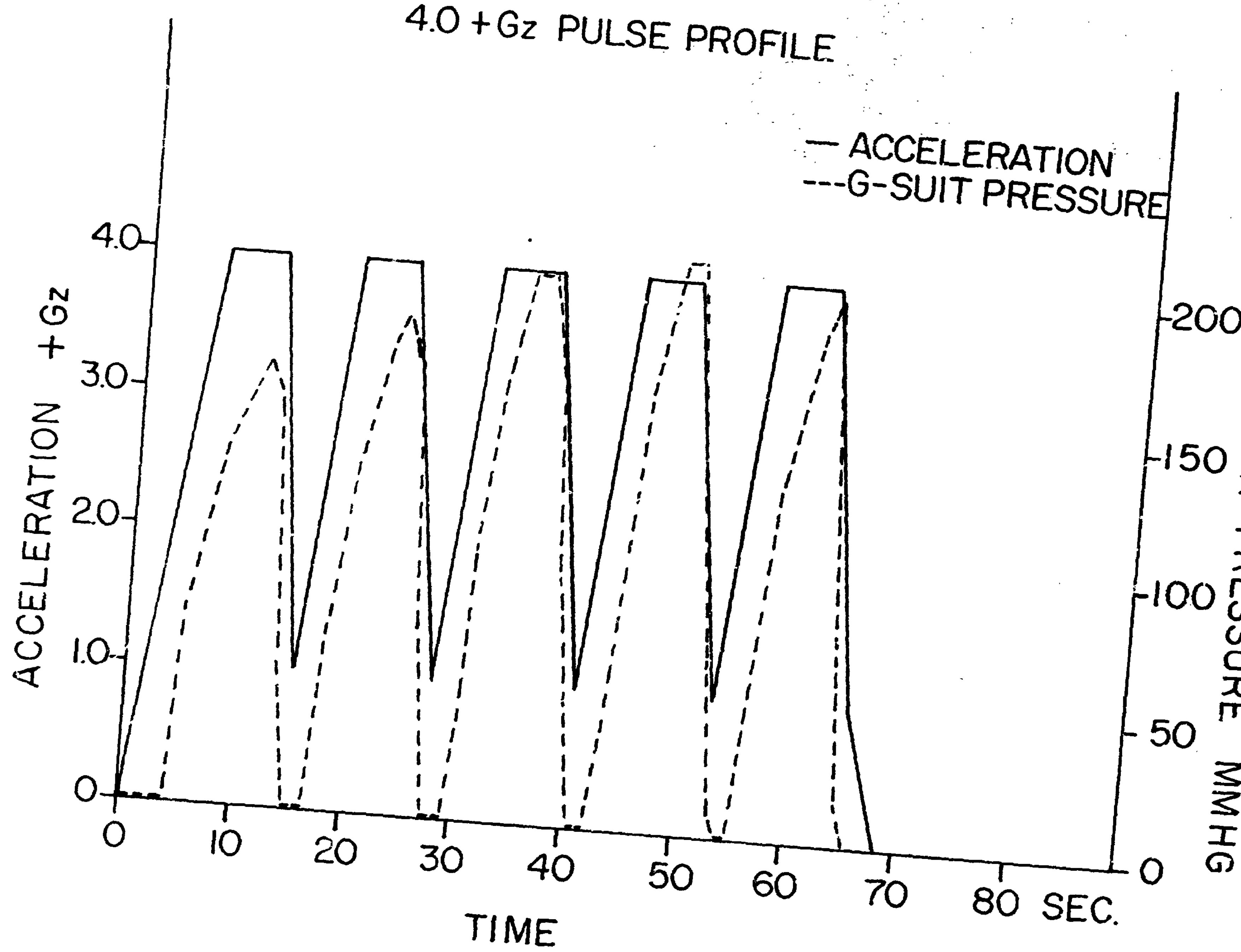

4.0 +Gz PULSE PROFILE
— ACCELERATION
---G-SUIT PRESSURE
ACCELERATION +Gz
4.0
3.0
2.0
1.0
0
G-SUIT PRESSURE MMHG
200
150
100
50
0
0
10
20
30
40
50
60
70
80 SEC.
TIME

Figure 5

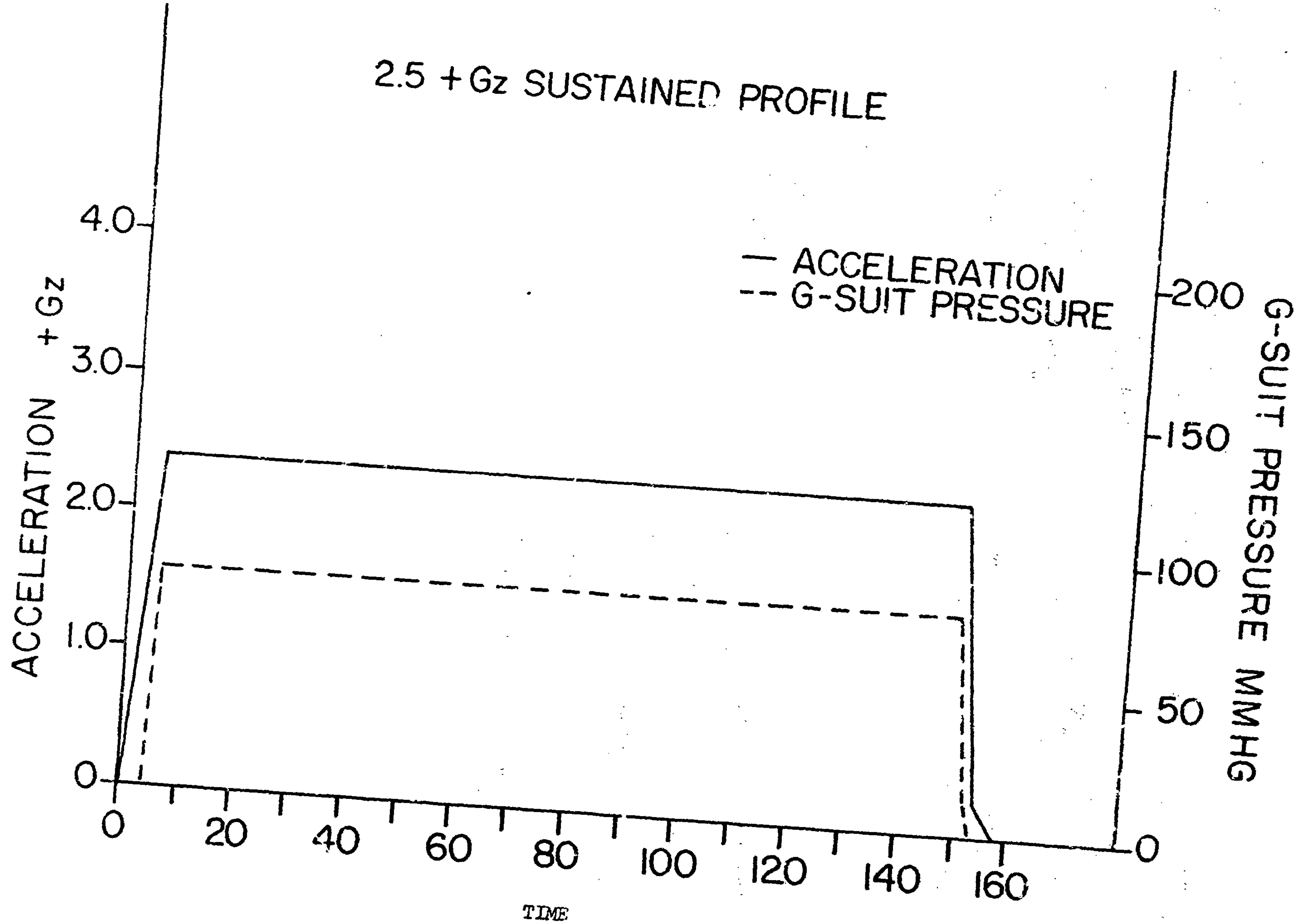

2.5 +Gz SUSTAINED PROFILE
— ACCELERATION
-- G-SUIT PRESSURE
ACCELERATION +Gz
4.0
3.0
2.0
1.0
0
G-SUIT PRESSURE MMHG
200
150
100
50
0
0
20
40
60
80
100
120
140
160
TIME

Figure 6

during the 4 + Gz ACM, the 4 + Gz Pulse, and the 2.5 + Gz Sustained Acceleration Profiles, respectively. The subjects were exposed to the three acceleration profiles with and without antigravity protection.

RESULTS

Data were obtained from five dogs during the course of this study with the first subject (Dog B) being used primarily for the development of acceleration profiles and the scaling of these profiles to the dog's acceleration tolerance. In addition, it became necessary to further develop an animal restraint system for the dogs to eliminate the need for an investigator to ride with the conscious subject. Consequently, Dog B was used for the further development of the restraint system. Results obtained from these preliminary studies on Dog B are not presented, since the acceleration profiles employed were variable both in magnitude of acceleration and in duration of exposure.

A. 4.0 + Gz ACM Profile Exposures

Control and carotid sinus denervation data obtained from Dog A and Dog L during exposure to the 4.0 + Gz ACM with and without antigravity protection are shown in Tables 1-4 and in Figures 7-19, and control data for Dog D and Dog M are shown in Tables 5 and 6 and in Figures 20-22. Figures 23-32 show the comparison between the control response and the response obtained after carotid sinus denervation in Dog A with and without antigravity protection and in Dog L without antigravity protection.

B. 4.0 + Gz Pulse Profile Exposures

Control and carotid sinus denervation data obtained from Dog A and Dog L during exposure to the 5-cycle 4.0 + Pulse Profile with and without antigravity protection are shown in Tables 7-10 and data obtained from Dog D and Dog M without antigravity protectior are shown in Tables 11 and 12.

C. 2.5 + Gz Sustained Profile

Control and carotid sinus denervation data obtained from Dog A and Dog L during exposure to the 2.5 + Sustained Profile with and without antigravity protection are shown in Tables 13-16 and data obtained from Dog D and Dog M without antigravity protection are shown in Tables 17 and 18.

DISCUSSION

The control responses obtained during exposure to the 4.0 + Gz ACM Profile consisted of an average decrease in carotid flow of 20% below normal, and there was no apparent overall significant difference between the Control Group and the carotid sinus denervation group (Group A). Central arterial pressure in the Control Group rose to an average of 30% above normal, while the average pressure in Group A was 25% above normal. The major distinction between the Control Group and Group A appeared in the heart rate response required to maintain central arterial pressure and carotid arterial flow. The heart rate in the Control Group averaged 24% above normal, while in Group A the average rate was 74% above normal.

Exposure to the 4.0 + Gz Pulse Profile resulted in an average decrease in carotid blood flow of 49% at the 4.0 + Gz peaks in the Control Group and a decrease of 66% in Group A. Central arterial pressure at the 4.0 + Gz peak was increased 19% in the Control Group and 2% in Group A, while eye level pressure decreased 90% in the Control Group and 100% in Group A at the 4.0 + Gz peak. Average heart rates at the 4.0 + Gz peaks increased by 89% in the controls and by 141% in Group A.

Exposure to the 2.5 + Gz Sustained Profile resulted in an average decrease in carotid blood flow of 20% in both the Control Group and in Group A. Central arterial pressure was increased 20% above normal in the Control Group and 10% above normal in Group A. Eye level mean blood pressures decreased 35% below normal in the Control Group and 50% below normal in Group A. Heart rates increased an average of 40% above normal in the Control Group and 55% above normal in Group A.

The use of the antigravity suit abdominal bladder assisted in maintaining the carotid flow and eye level arterial pressure in both the control and denervated groups. The effect of the suit during exposure to all profiles was to create a condition where for a given level of carotid blood flow the heart rate was significantly lower and the central and eye level blood pressures were significantly higher than in the unprotected state. The most pronounced decrement in the ability to maintain carotid flow produced by carotid sinus denervation was in the environment where

the rate of onset of the acceleration forces was the greatest. Further, denervation resulted in a lower central and eye level arterial pressure despite a greatly elevated heart rate. It was felt that the primary effect on cardiovascular hemodynamics of the denervation was to attenuate the expected p ripheral resistance changes to rapid onset acceleration, thus necessitating significantly higher heart rates and probably cardiac outputs for a given carotid flow and eye level blood pressure.

TABLE I

ACM PROFILE
NO G-SUIT
SUBJECT: DOG A

( )=$S\bar{x}$

+Gz Level		1.0	2.5	2.0	3.0	2.0	4.0	2.5	3.5	2.5	3.0	1.0	STOP		n	
CAROTID FLOW	CONT	83.7 (3.4)	66.4 (4.0)	55.3 (7.2)	37.9 (8.9)	61.7 (8.4)	14.6 (5.0)	38.7 (7.2)	31.4 (9.6)	53.5 (11.1)	46.3 (12.1)	90.5 (6.6)	116.9 (7.8)		6	
	C/S DEN															
VENA CAVA FLOW	CONT	90.2 (1.4)	73.6 (3.6)	75.8 (2.2)	76.1 (2.7)	76.6 (3.5)	73.4 (2.1)	76.2 (4.1)	75.3 (2.8)	74.5 (2.8)	77.9 (2.9)	80.5 (2.4)	106.5 (5.1)		11	
	C/S DEN	126.9 (9.1)	103.3 (6.1)	115.3 (3.3)	107.9 (4.9)	115.1 (3.7)	92.4 (10.5)	103.7 (3.1)	102.6 (6.4)	103.1 (6.6)	99.3 (4.[illegible])	152.8 (7.9)	163.5 (7.9)		7	
CENTERAL ARTERIAL PRESSURE	CONT	109.2 (1.2)	118.5 (3.2)	116.9 (2.1)	131.0 (2.9)	120.0 (2.0)	136.0 (4.5)	132.1 (3.2)	138.4 (3.5)	132.2 (3.4)	138.6 (3.5)	80.5 (2.4)	106.5 (5.1)		26	
	C/S DEN	143.1 (6.1)	165.1 (4.7)	159.1 (3.7)	190.0 (5.6)	165.6 (2.5)	219.7 (7.5)	200.4 (5.9)	223.0 (7.9)	199.7 (6.3)	216.9 (5.6)	154.7 (6.4)	138.3 (9.5)		7	
EYE LEVEL PRESSURE	CONT	87.2	64.5	72.9	66.0	76.0	49.0	78.1	62.4	78.2	73.6	89.0	107.2		26	
	C/S DEN	94.1	43.1	61.1	43.0	71.0	23.7	78.4	52.0	77.7	69.9	105.7	138.3		7	
HEART RATE	CONT	136.4 (4.9)	157.4 (8.1)	135.4 (6.[illegible])	153.6 (8.1)	142.6 (10.[illegible])	152.6 (10.7)	145.9 (8.0)	152.2 (8.9)	150.1 (7.4)	150.5 (7.4)	156.6 (8.7)	123.6 (4.2)		26	
	C/S DEN	119.4 (7.7)	134.1 (10.9)	117.6 (10.2)	119.3 (10.2)	101.7 (16.5)	123.6 (6.3)	121.3 (9.2)	140.3 (6.6)	124.0 (13.[illegible])	135.7 (11.7)	168.1 (6.8)	151.0 (11.0)		7	

TABLE 2

ACM PROFILE
G-SUIT
SUBJECT: DOG A

( ) = $S\bar{x}$

$+G_z$	LEVEL	1.0	2.5	2.0	3.0	2.0	4.0	2.5	3.5	2.5	3.0	1.0	STOP		n	
CAROTID FLOW	CONT	101.3 (11.1)	62.3 (5.7)	78.6 (10.4)	52.4 (5.6)	60.8 (5.4)	10.8 (5.1)	35.8 (11.9)	21.6 (9.8)	41.0 (9.5)	28.1 (10.2)	106.9 (11.2)	143.4 (16.3)		7	
	C/S DEN															
VENA CAVA FLOW	CONT	103.5 (6.0)	97.5 (7.2)	94.3 (4.0)	87.3 (7.2)	91.5 (5.3)	85.0 (3.3)	91.3 (2.9)	83.3 (4.0)	88.5 (6.0)	86.8 (4.9)	97.5 (6.7)	101.5 (1.5)		4	
	C/S DEN	146.8 (7.2)	141.0 (6.8)	121.6 (8.0)	100.2 (13.0)	122.0 (7.3)	39.6 (9.2)	90.8 (8.3)	67.2 (9.3)	96.6 (8.1)	80.4 (9.5)	147.4 (13.4)	159.4 (8.9)		5	
CENTERAL ARTERIAL PRESSURE	CONT	113.4 (0.9)	133.4 (1.8)	127.8 (1.2)	145.1 (1.6)	134.3 (2.5)	154.8 (1.8)	147.3 (3.1)	155.8 (2.5)	148.3 (2.2)	148.4 (1.4)	123.1 (2.0)	107.3 (4.0)		11	
	C/S DEN	139.6 (10.5)	159.0 (4.6)	156.4 (7.1)	184.4 (8.4)	162.6 (7.9)	215.8 (15.2)	198.4 (10.6)	220.0 (13.3)	194.6 (12.2)	209.4 (7.4)	140.2 (4.5)	141.4 (8.4)		5	
EYE LEVEL PRESSURE	CONT	89.4	73.4	79.8	73.1	86.3	58.8	87.3	71.8	88.3	76.4	99.1	107.3		11	
	C/S DEN	89.6	34.0	56.4	34.4	62.6	15.8	73.4	45.0	69.6	59.4	90.2	141.4		5	
HEART RATE	CONT	131.3 (4.4)	116.9 (5.0)	106.[illegible] (2.9)	121.1 (3.4)	104.9 (4.4)	135.3 (4.6)	114.1 (2.1)	126.2 (4.[illegible])	122.3 (6.1)	127.6 (4.9)	122.6 (5.2)	114.3 (3.9)		11	
	C/S DEN	107.8 (5.1)	118.0 (8.4)	102.8 (2.8)	118.6 (8.3)	112.8 (9.[illegible])	118.0 (2.9)	123.6 (10.5)	120.2 (4.7)	110.4 (4.[illegible])	120.2 (5.1)	166.0 (10.7)	136.4 (10.6)		5	

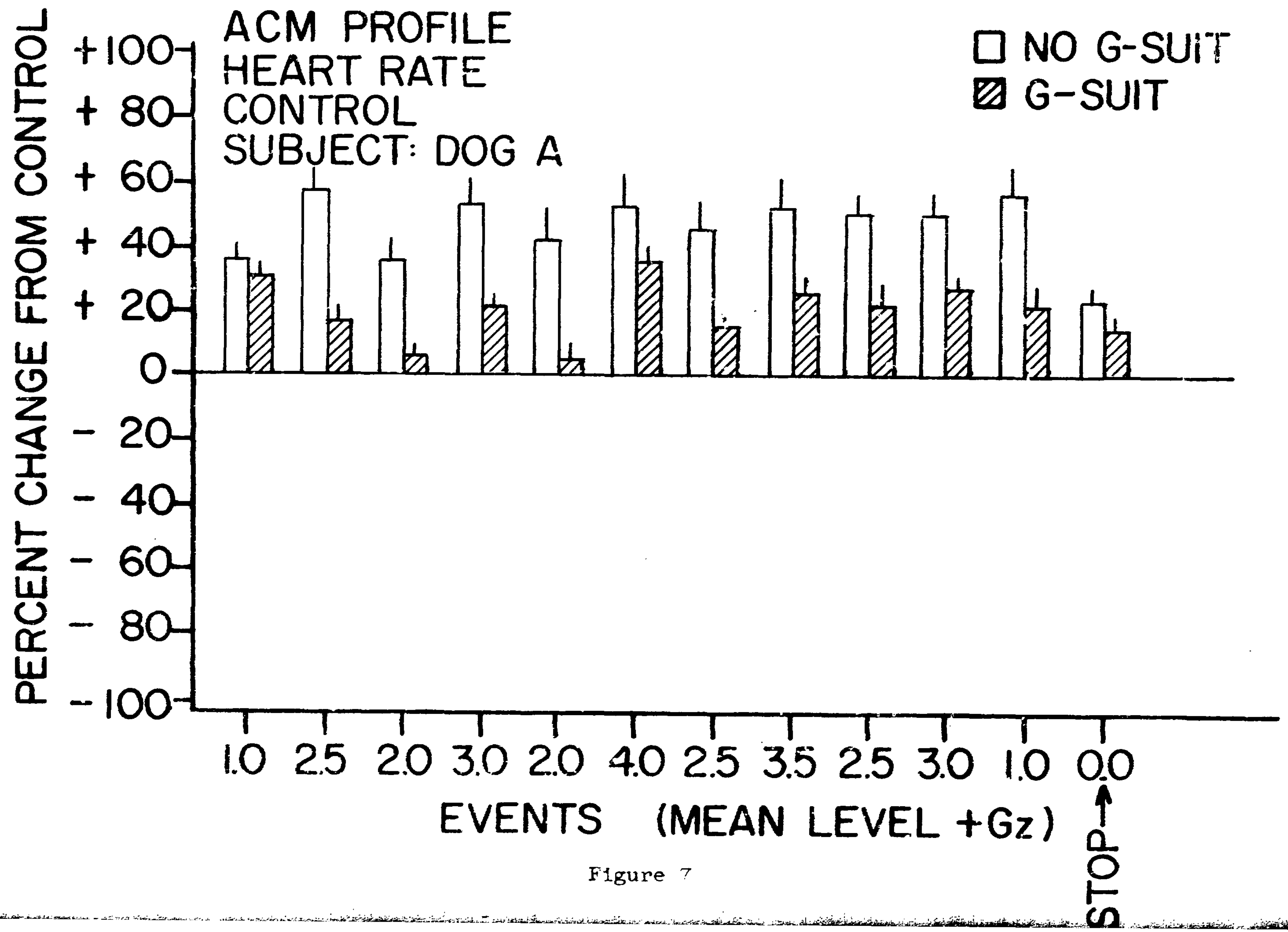

ACM PROFILE
HEART RATE
CONTROL
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 7

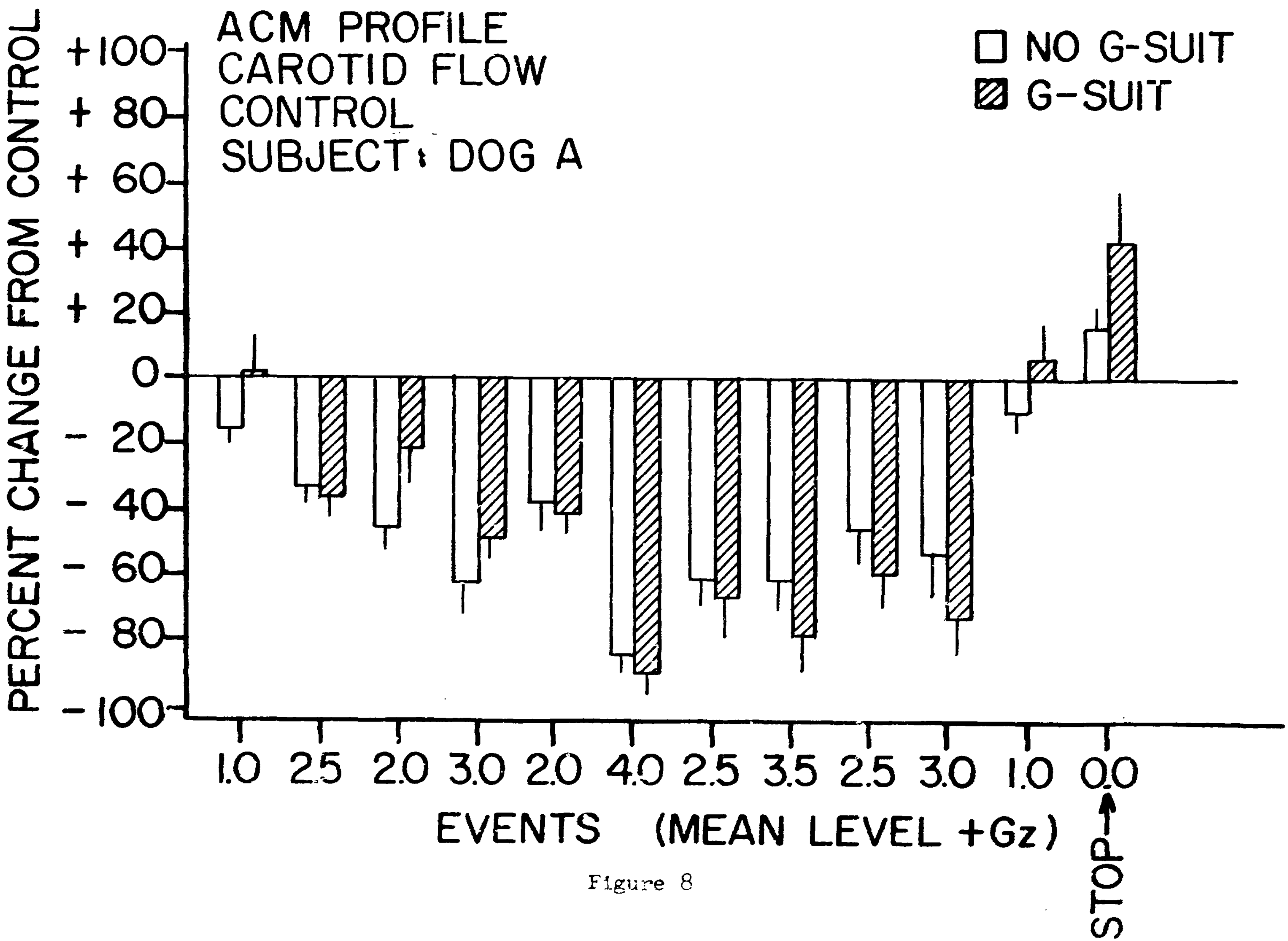

ACM PROFILE
CAROTID FLOW
CONTROL
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 8

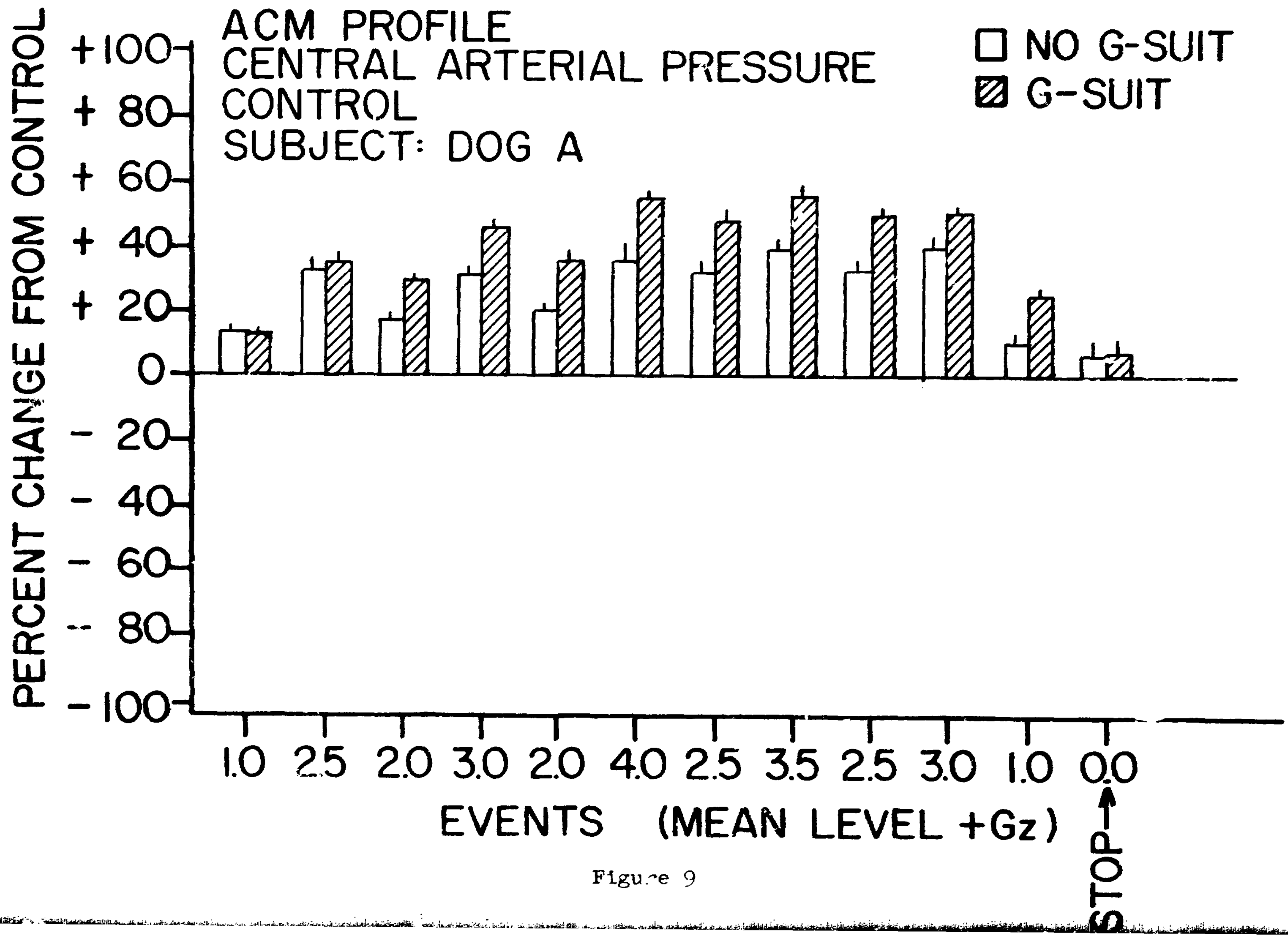

ACM PROFILE
CENTRAL ARTERIAL PRESSURE
CONTROL
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 9

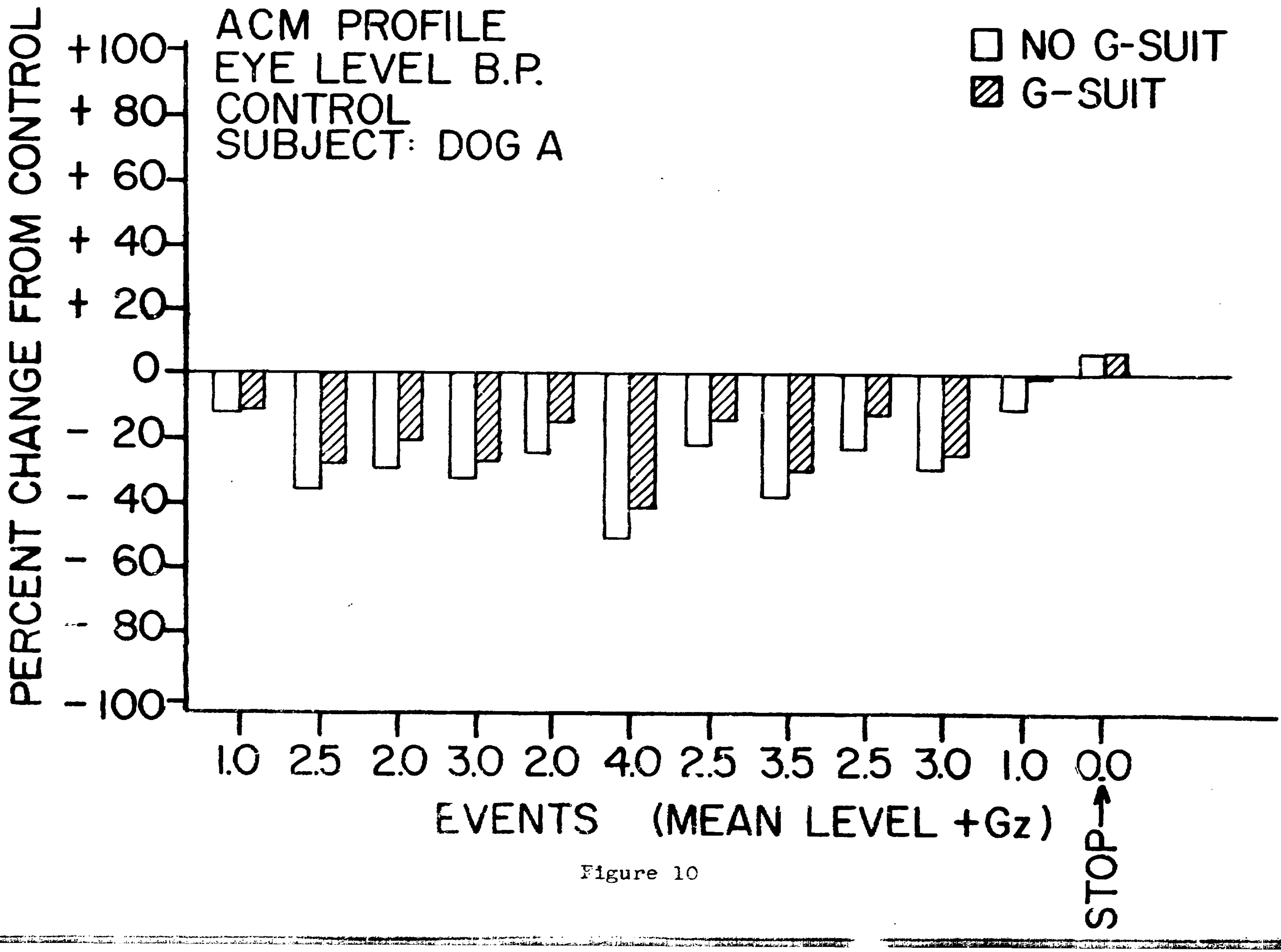

ACM PROFILE
EYE LEVEL B.P.
CONTROL
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0
2.5
2.0
3.0
2.0
4.0
2.5
3.5
2.5
3.0
1.0
0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 10

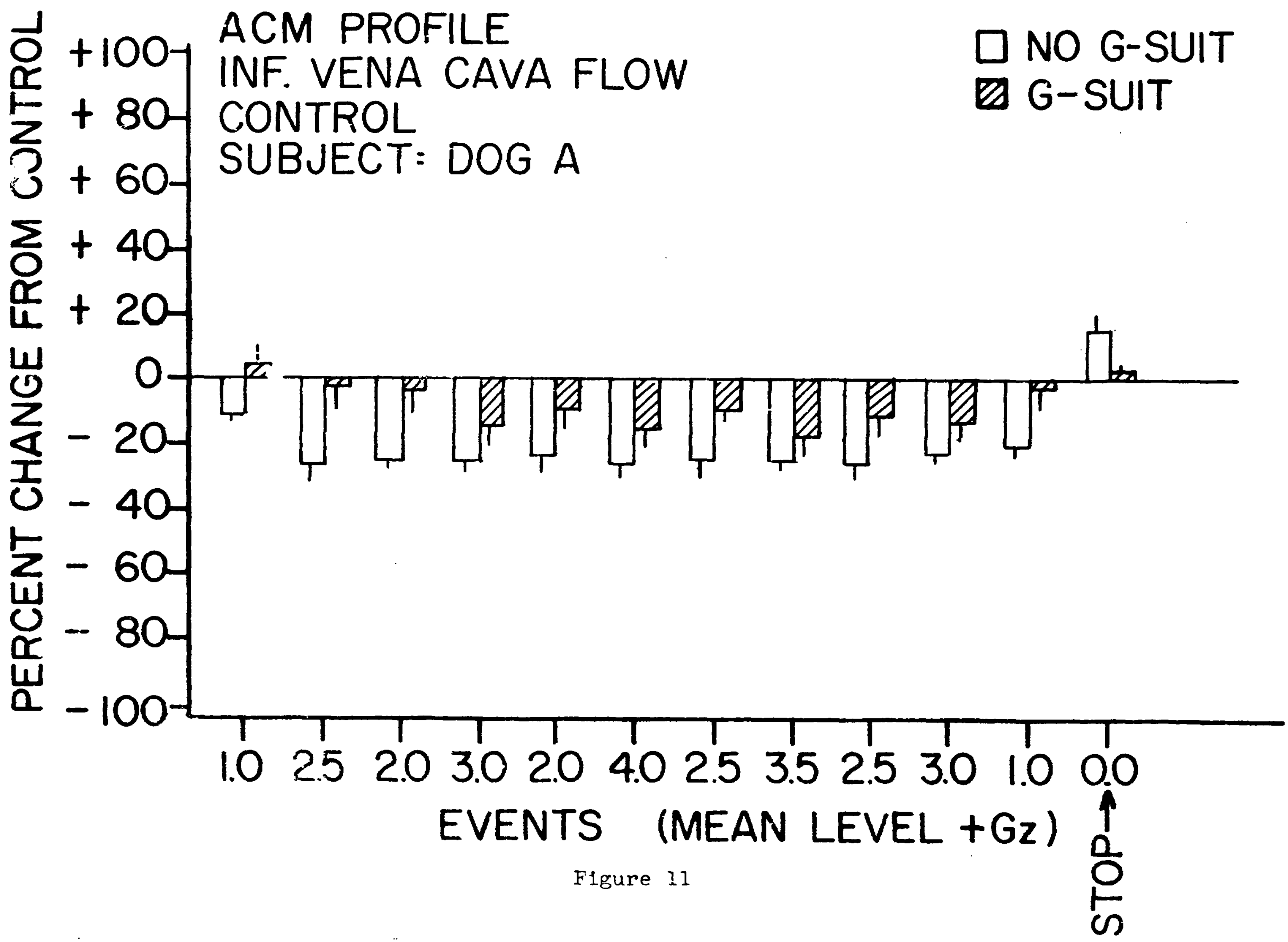

ACM PROFILE
INF. VENA CAVA FLOW
CONTROL
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
-100
1.0
2.5
2.0
3.0
2.0
4.0
2.5
3.5
2.5
3.0
1.0
0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 11

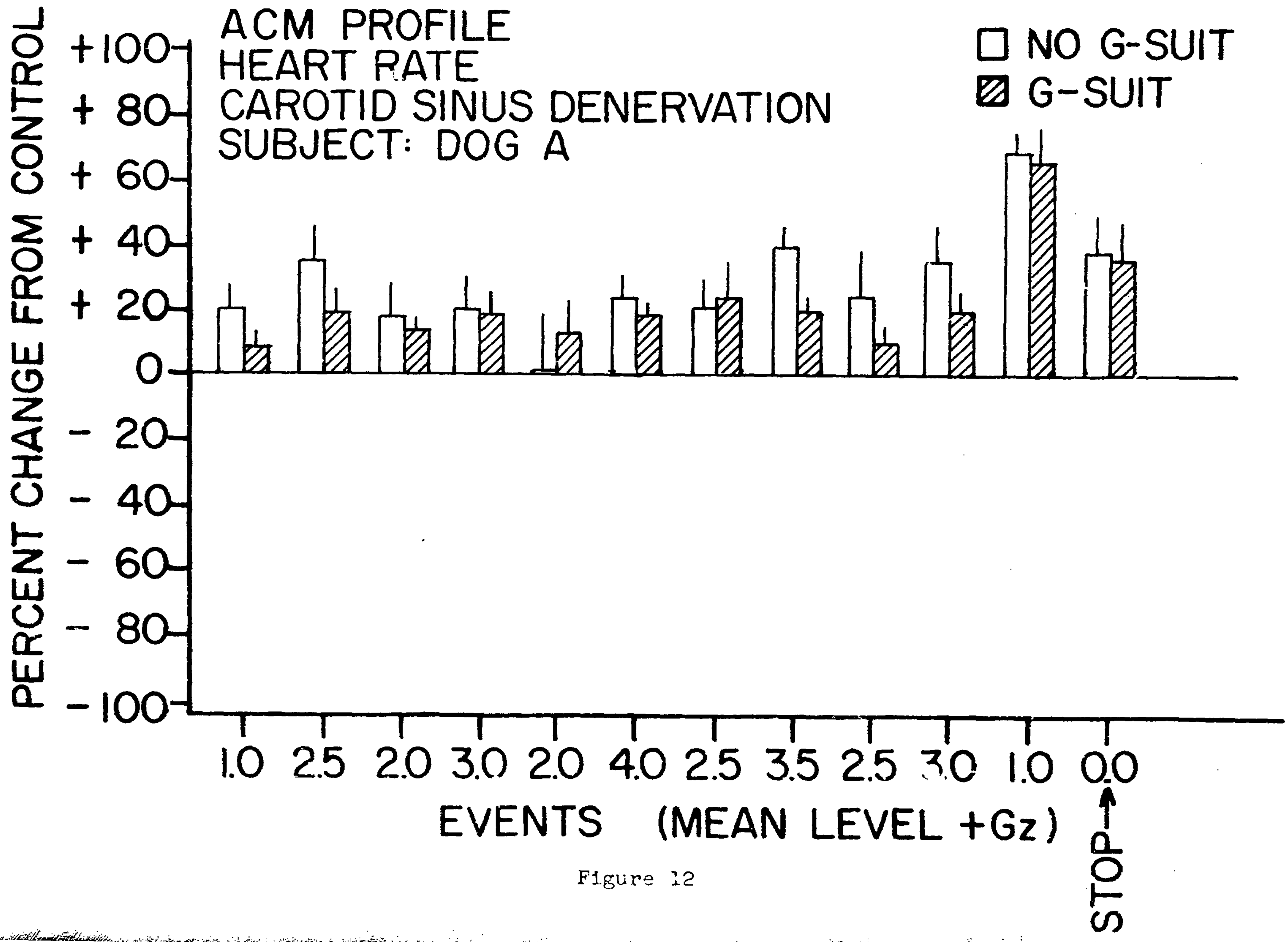

ACM PROFILE
HEART RATE
CAROTID SINUS DENERVATION
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 12

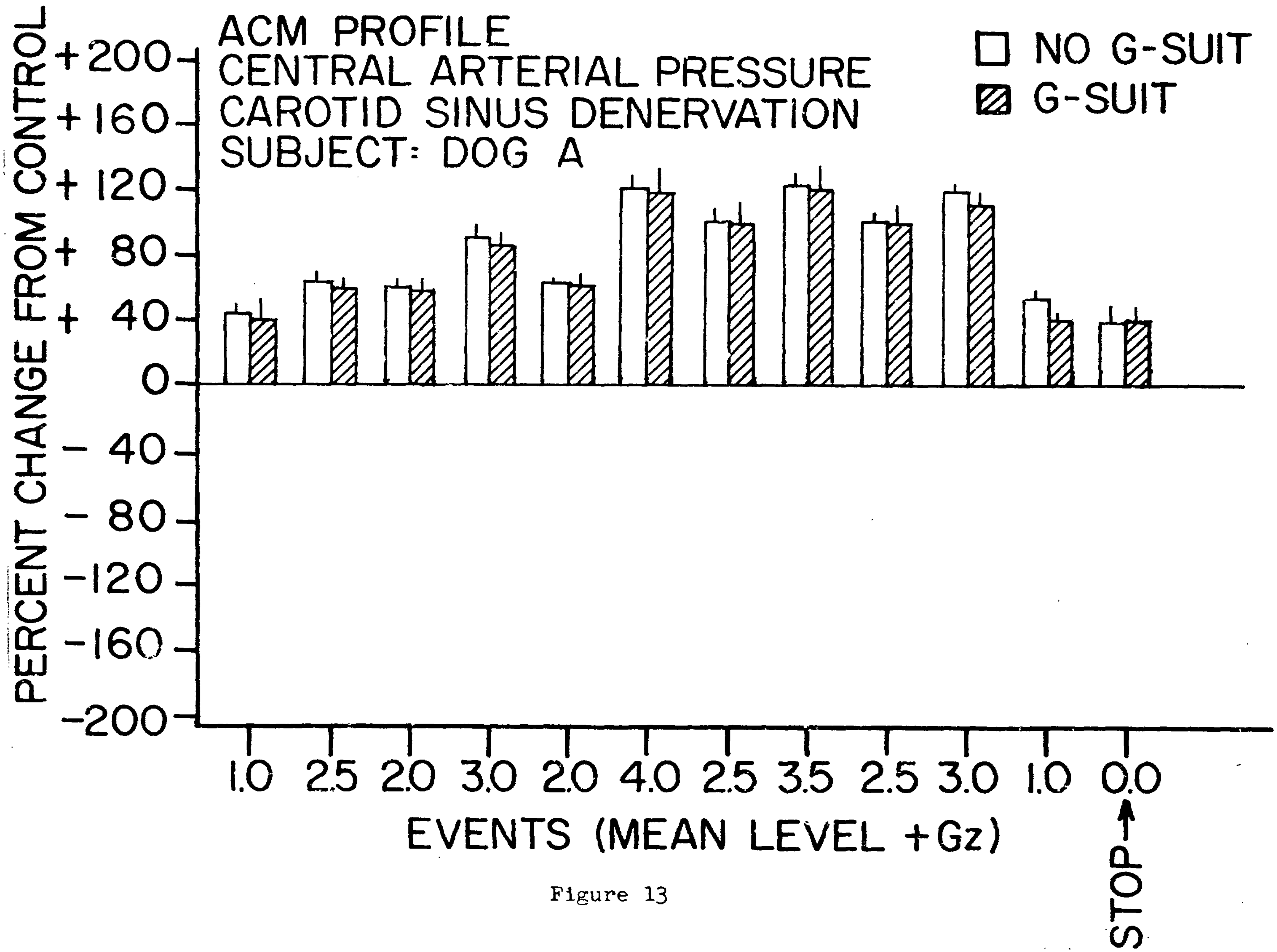

ACM PROFILE
CENTRAL ARTERIAL PRESSURE
CAROTID SINUS DENERVATION
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+200
+160
+120
+80
+40
0
-40
-80
-120
-160
-200
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 13

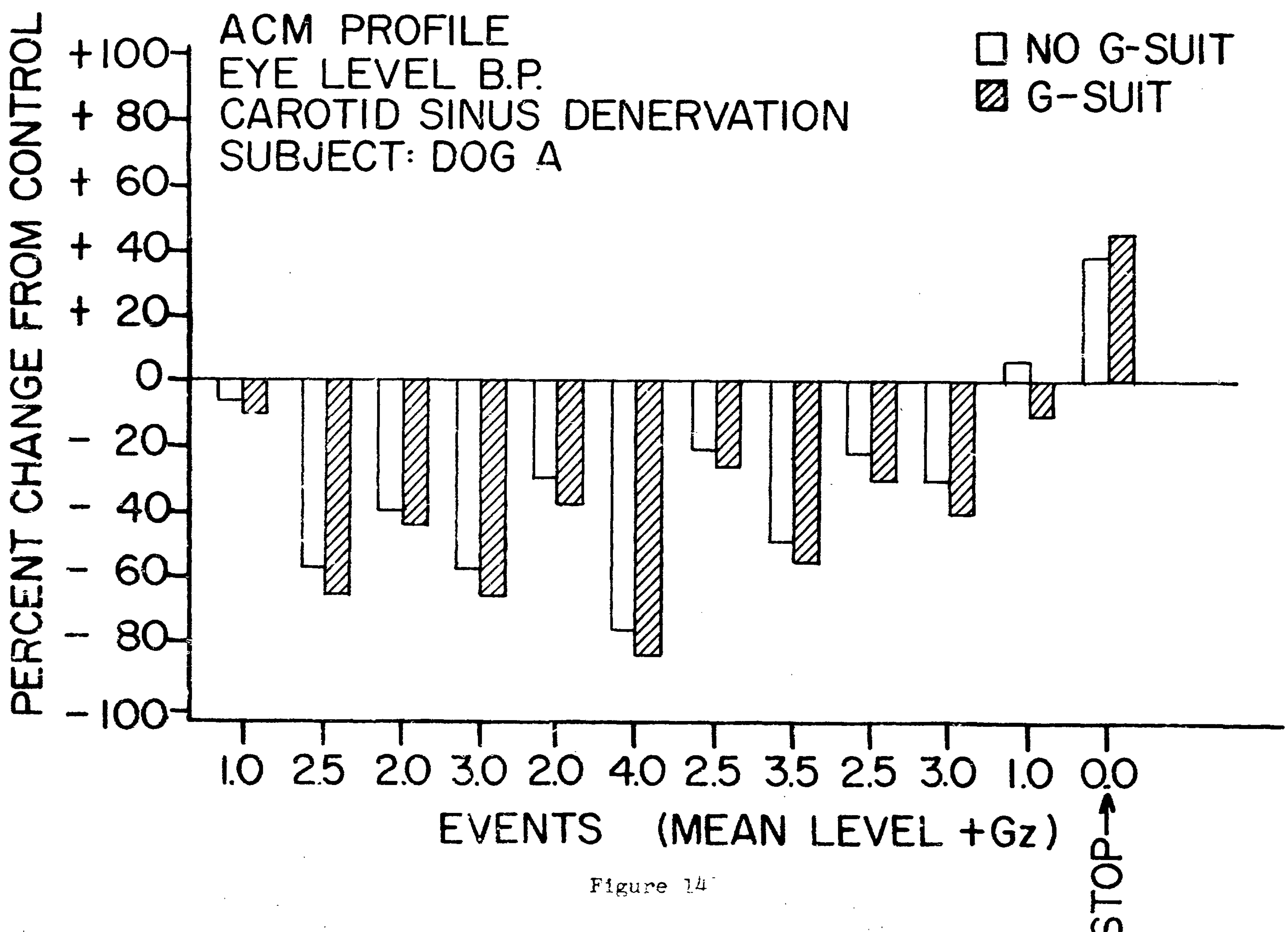

ACM PROFILE
EYE LEVEL B.P.
CAROTID SINUS DENERVATION
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 14

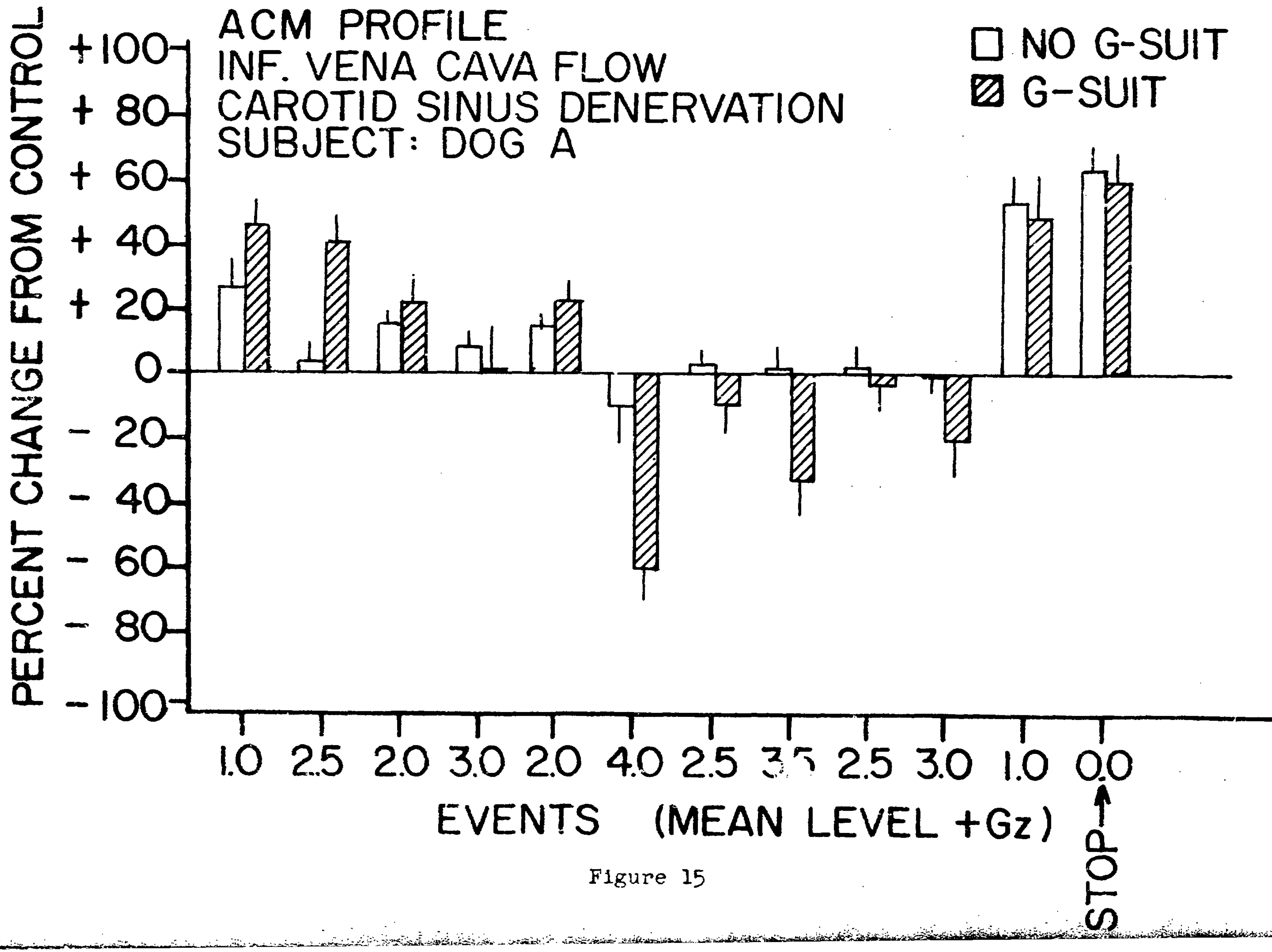

ACM PROFILE
INF. VENA CAVA FLOW
CAROTID SINUS DENERVATION
SUBJECT: DOG A
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 15

TABLE 3

ACM PROFILE
NO G-SUIT
SUBJECT = DOG L

( ) = $S_{\bar{x}}$

$+G_z$ Level		1.0	2.5	2.0	3.0	2.0	4.0	2.5	3.5	2.5	3.0	1.0	STOP		n	
CAROTID FLOW	CONT	80.9 (4.1)	62.9 (5.3)	80.1 (5.6)	62.5 (6.4)	98.2 (7.4)	41.6 (5.9)	90.7 (5.7)	66.4 (6.2)	86.7 (7.8)	74.5 (6.4)	125.8 (8.8)	185.0 (7.6)		30	
	C/S DEN	86.0 (3.6)	85.9 (7.3)	89.2 (5.4)	91.4 (5.6)	105.4 (6.3)	79.4 (5.7)	113.0 (9.0)	81.8 (5.5)	100.7 (6.2)	86.0 (5.9)	134.6 (6.9)	169.3 (6.5)		27	
VENA CAVA FLOW	CONT	94.6 (2.8)	105.0 (2.9)	98.2 (2.9)	88.3 (2.4)	94.3 (3.9)	97.0 (3.3)	96.7 (3.0)	91.6 (4.2)	97.7 (2.7)	91.6 (4.8)	100.8 (5.5)	125.0 (10.4)		30	
	C/S DEN															
CENTERAL ARTERIAL PRESSURE	CONT															
	C/S DEN	108.5 (4.3)	127.1 (7.6)	130.0 (5.8)	121.0 (9.1)	119.3 (8.9)	130.5 (9.1)	131.6 (9.7)	147.8 (10.3)	133.7 (10.2)	139.8 (7.7)	106.6 (6.7)	127.4 (9.8)		11	
EYE LEVEL PRESSURE	CONT															
	C/S DEN	73.5	38.1	59.0	15.0	48.3	0.0	42.6	23.8	44.7	33.8	71.[illegible]	127.4		11	
HEART RATE	CONT	112.0 (4.5)	175.1 (8.0)	155.4 (8.1)	157.2 ([illegible].2)	148.3 ([illegible])	165.5 (7.3)	133.8 (7.4)	156.0 (6.3)	157.8 (9.8)	150.4 (8.[illegible])	188.3 (7.7)	179.9 (6.3)		30	
	C/S DEN	118.2 (4.2)	149.9 (10.8)	138.6 (8.6)	155.5 ([illegible].7)	169.4 (11.7)	152.8 (9.4)	182.6 (11.5)	173.4 (11.7)	157.8 (9.5)	1[illegible].5 ([illegible].5)	187.7 (5.5)	177.9 (6.8)		27	

TABLE 4

ACM PROFILE
G-SUIT
SUBJECT: DOG L

( )=$S\bar{y}$

$+G_z$ Level		1.0	2.5	2.0	3.0	2.0	4.0	2.5	3.5	2.5	3.0	1.0	STOP		n	
CAROTID FLOW	CONT															
	C/S DEN	94.4 (7.6)	86.2 (9.3)	120.0 (11.0)	106.2 (12.5)	129.8 (13.3)	87.7 (10.2)	126.7 (10.7)	95.8 (12.6)	128.2 (6.5)	117.0 (8.6)	135.7 (10.9)	182.3 (15.6)		5	
VENA CAVA FLOW	CONT															
	C/S DEN															
CENTERAL ARTERIAL PRESSURE	CONT															
	C/S DEN	111.8 (4.1)	147.0 (5.3)	148.7 (6.7)	157.2 (4.6)	155.7 (3.0)	170.0 (1.3)	161.5 (4.5)	174.0 (7.0)	168.5 (5.7)	174.5 (7.6)	122.2 (6.0)	133.2 (4.4)		5	
EYE LEVEL PRESSURE	CONT															
	C/S DEN	73	51	71.7	41.9	78.7	16.0	65.5	39	72.5	59.4	84.2	133.2		5	
HEART RATE	CONT															
	C/S DEN	144.3 (9.4)	13[illegible].5 (4.[illegible])	148.5 (11.5)	16[illegible].5 (15.[illegible])	145.2 (10.[illegible])	139.2 (18.1)	161.5 (23.7)	171.7 (19.5)	169.2 (11.1)	148.3 ([illegible]4.0)	186.6 (11.3)	164.4 (22.4)		5	

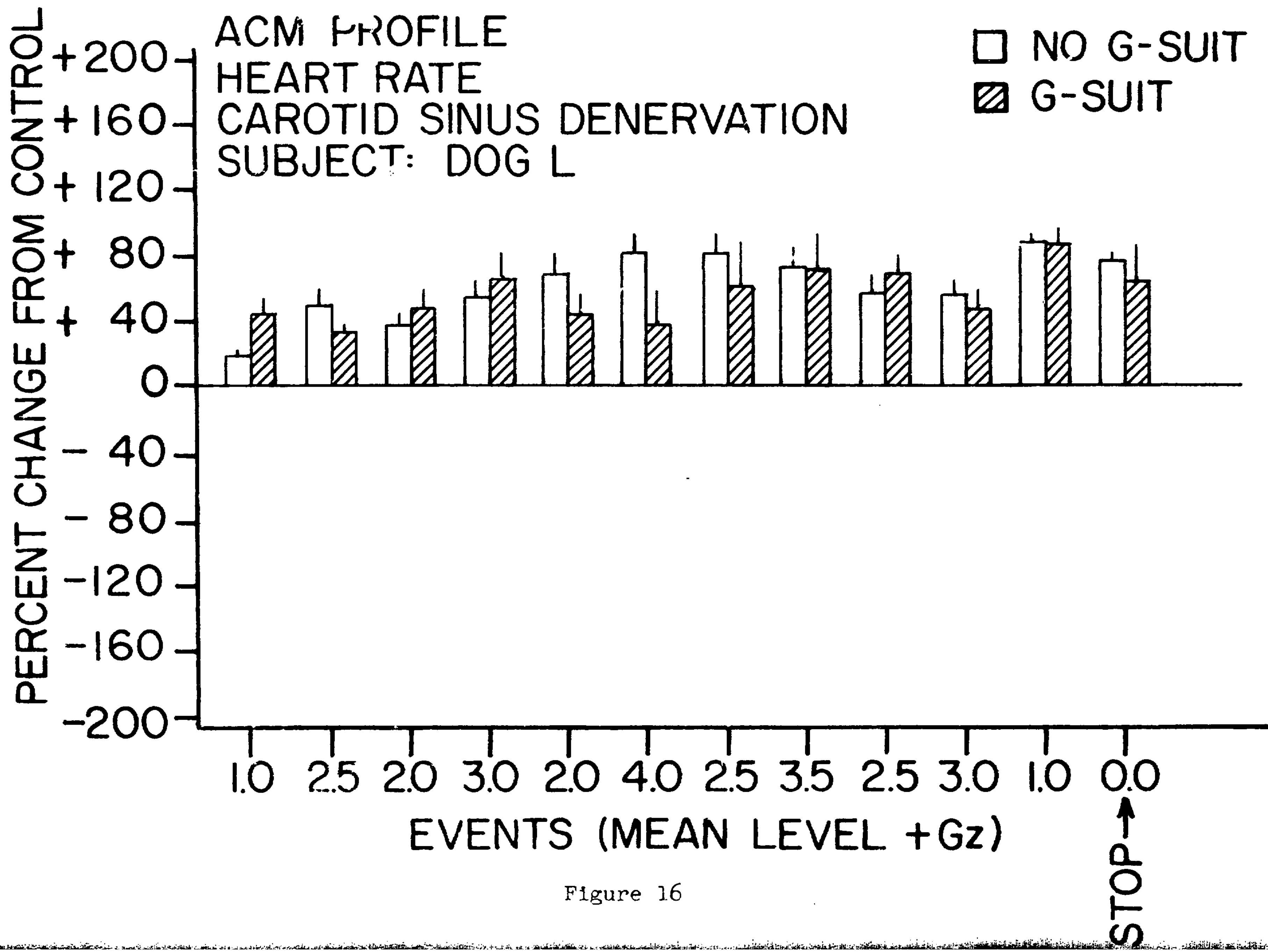

ACM PROFILE
HEART RATE
CAROTID SINUS DENERVATION
SUBJECT: DOG L
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+200
+160
+120
+80
+40
0
-40
-80
-120
-160
-200
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 16

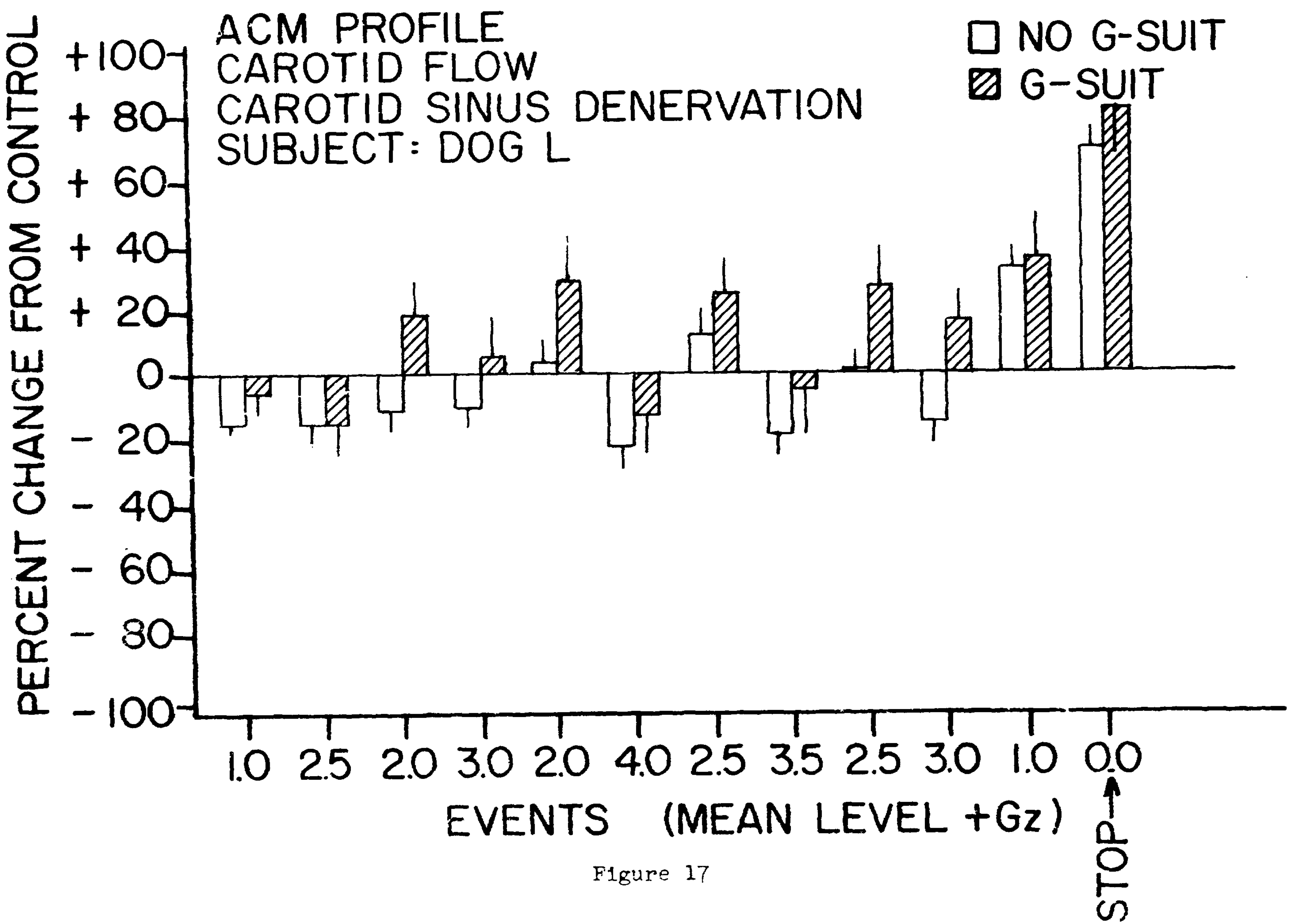

ACM PROFILE
CAROTID FLOW
CAROTID SINUS DENERVATION
SUBJECT: DOG L
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 17

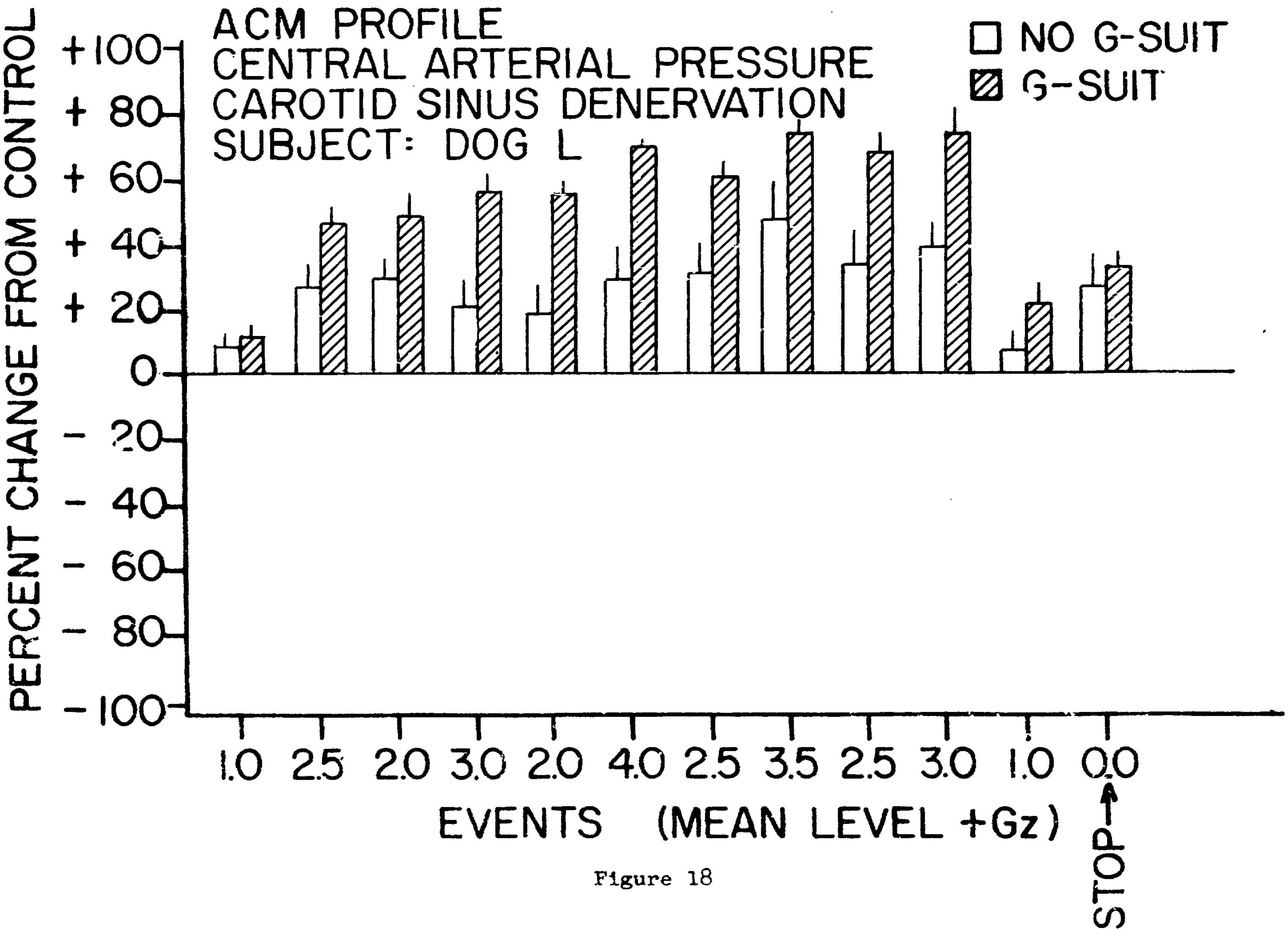

ACM PROFILE
CENTRAL ARTERIAL PRESSURE
CAROTID SINUS DENERVATION
SUBJECT: DOG L
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0
2.5
2.0
3.0
2.0
4.0
2.5
3.5
2.5
3.0
1.0
0.0
STOP
EVENTS (MEAN LEVEL +Gz)

Figure 18

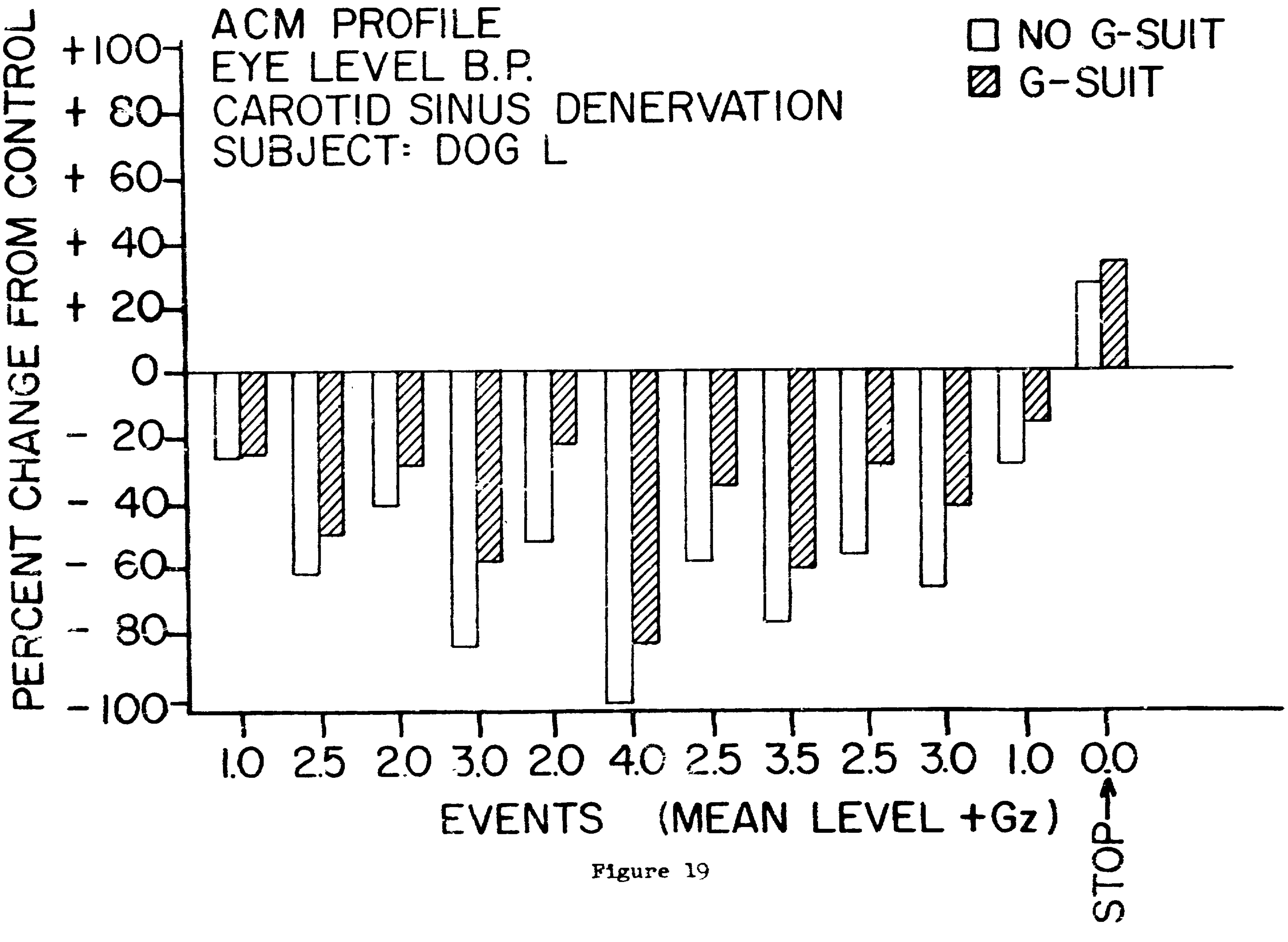

ACM PROFILE
EYE LEVEL B.P.
CAROTID SINUS DENERVATION
SUBJECT: DOG L
NO G-SUIT
G-SUIT
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 19

TABLE 5

ACM PROFILE
NO G-SUIT
SUBJECT = DOG D

( )=$S_{\bar{x}}$

$+G_z$ Level		1.0	2.5	2.0	3.0	2.0	4.0	2.5	3.5	2.5	3.0	1.0	STOP		n	
CAROTID FLOW	CONT	88.8 (4.7)	81.0 (3.1)	84.2 (1.7)	87.3 (2.2)	90.2 (3.1)	93.7 (3.5)	96.0 (4.4)	94.3 (4.2)	90.3 (3.7)	87.5 (3.3)	112.5 (3.9)	139.2 (7.1)		6	
	C/S DEN															
VENA CAVA FLOW	CONT															
	C/S DEN															
CENTERAL ARTERIAL PRESSURE	CONT	139.5 (23.7)	110.5 (20.4)	143.8 (12.2)	131.7 (20.3)	119.2 (26.3)	122.8 (30.2)	129.8 (15.7)	141.5 (19.8)	125.8 (18.8)	118.2 (25.3)	110.3 (14.4)	121.7 (13.5)		6	
	C/S DEN															
EYE LEVEL PRESSURE	CONT	100.0	13.0	66.1	15.1	41.4	0.0	21.6	5.4	28.3	1.6	71.6	121.7		6	
	C/S DEN															
HEART RATE	CONT	112.8 (13.6)	190.8 (9.2)	188.7 (9.[illegible])	200.5 (11.6)	188.3 (13.2)	192.2 (9.5)	184.2 (11.4)	184.2 (11.4)	179.2 (11.7)	143.3 (20.9)	129.2 (9.0)	124.0 (8.0)		6	
	C/S DEN															

TABLE 6

ACM PROFILE
NO G-SUIT
SUBJECT = DOG M

( ) = $S_{\bar{x}}$

$+G_z$ Level		1.0	2.5	2.0	3.0	2.0	4.0	2.5	3.5	2.5	3.0	1.0	STOP		n	
CAROTID FLOW	CONT															
	C/S DEN															
VENA CAVA FLOW	CONT															
	C/S DEN															
CENTERAL ARTERIAL PRESSURE	CONT	91.2 (10.8)	99.7 (13.9)	125.2 (16.0)	151.7 (9.5)	137.5 (12.0)	169.0 (11.2)	145.4 (5.3)	192.4 (11.7)	189.5 (8.9)	194.5 (6.8)	129.7 (8.3)	110.7 (6.3)		5	
	C/S DEN															
EYE LEVEL PRESSURE	CONT	39.9	0.0	15.1	0.0	26.7	0.0	0.0	7.4	63.3	40.6	89.6	110.7		5	
	C/S DEN															
HEART RATE	CONT	179.1 (11.1)	207.6 (9.7)	197.4 (15.4)	122.6 (5.8)	181.0 (11.3)	139.0 (8.3)	152.6 (15.0)	141.4 (6.9)	143.4 (16.9)	155.8 (17.6)	168.2 (13.0)	148.0 (11.2)		5	
	C/S DEN															

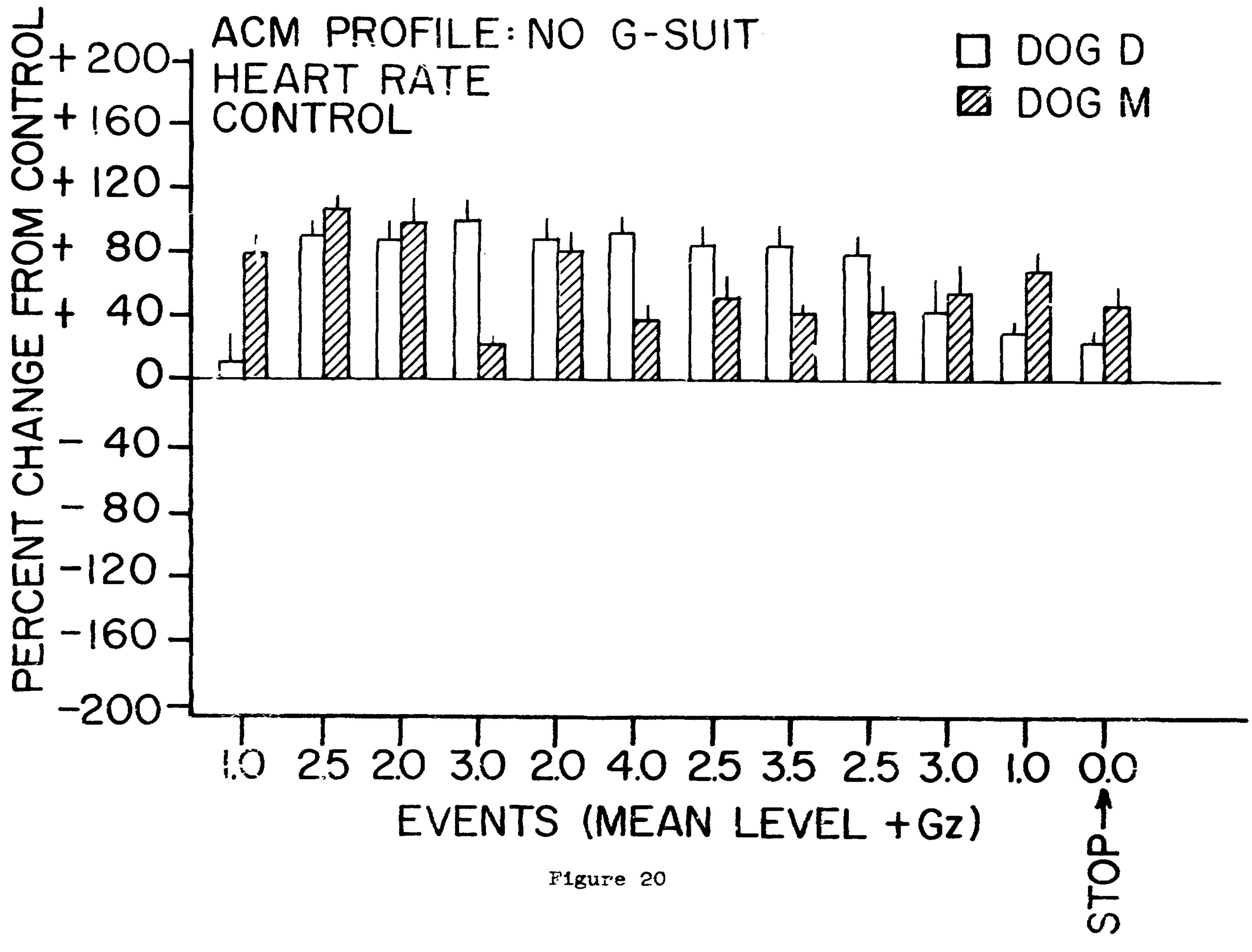

ACM PROFILE: NO G-SUIT
HEART RATE
CONTROL
DOG D
DOG M
PERCENT CHANGE FROM CONTROL
+200
+160
+120
+80
+40
0
-40
-80
-120
-160
-200
1.0
2.5
2.0
3.0
2.0
4.0
2.5
3.5
2.5
3.0
1.0
0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 20

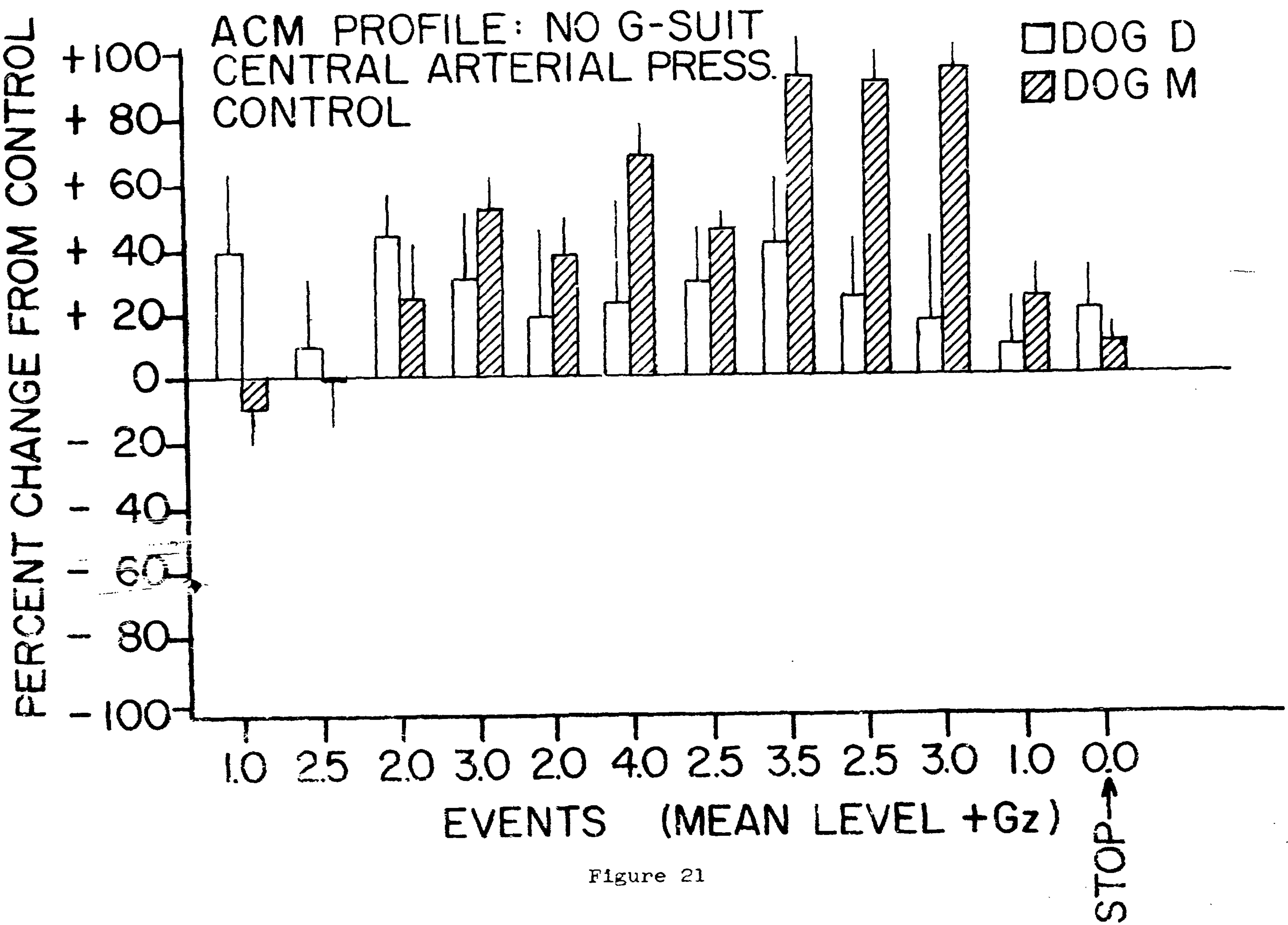

ACM PROFILE: NO G-SUIT
CENTRAL ARTERIAL PRESS.
CONTROL
DOG D
DOG M
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 21

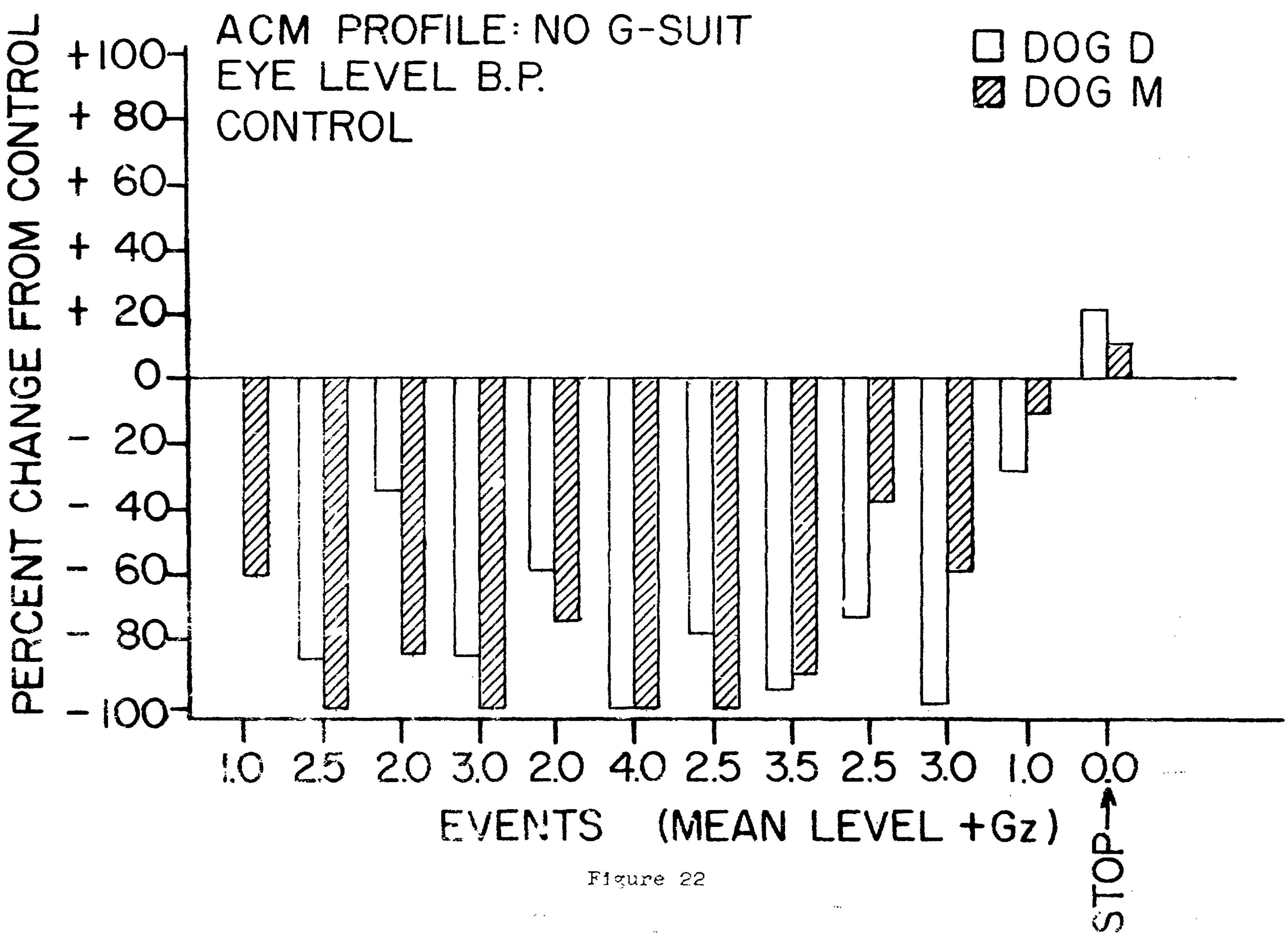

ACM PROFILE: NO G-SUIT
EYE LEVEL B.P.
CONTROL
DOG D
DOG M
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
- 100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 22

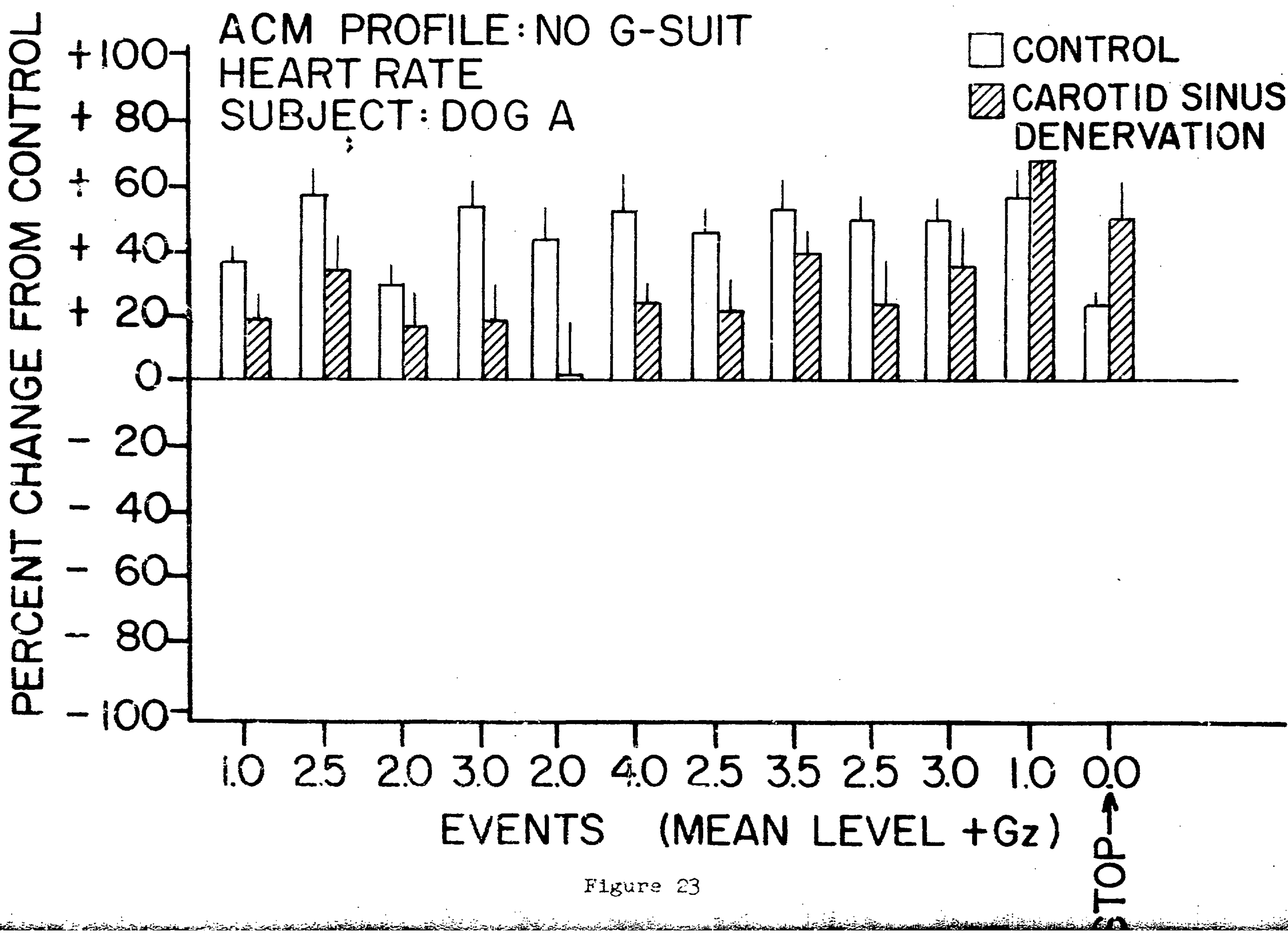

ACM PROFILE: NO G-SUIT
HEART RATE
SUBJECT: DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 23

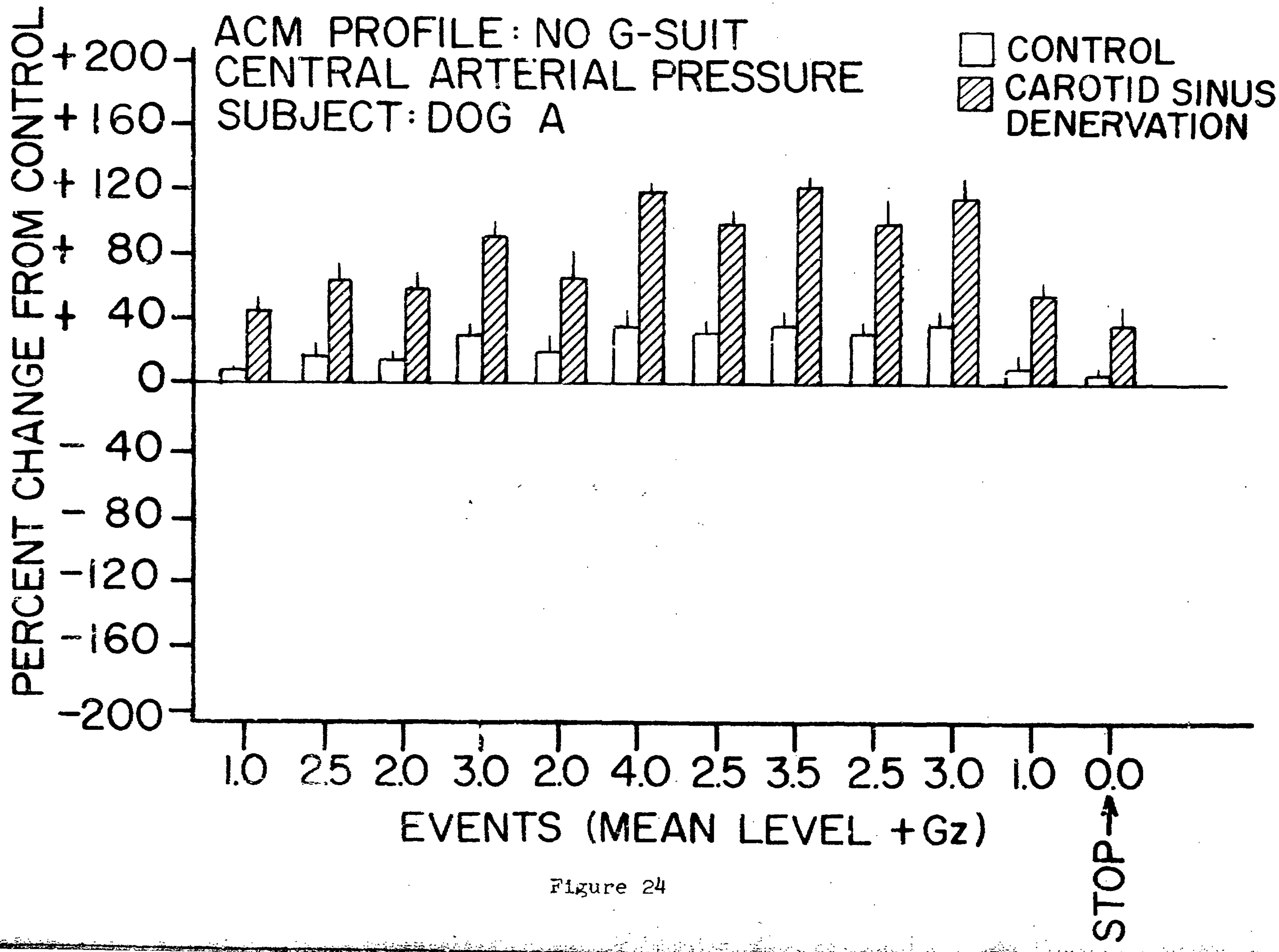

ACM PROFILE: NO G-SUIT
CENTRAL ARTERIAL PRESSURE
SUBJECT: DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+200
+160
+120
+80
+40
0
-40
-80
-120
-160
-200
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 24

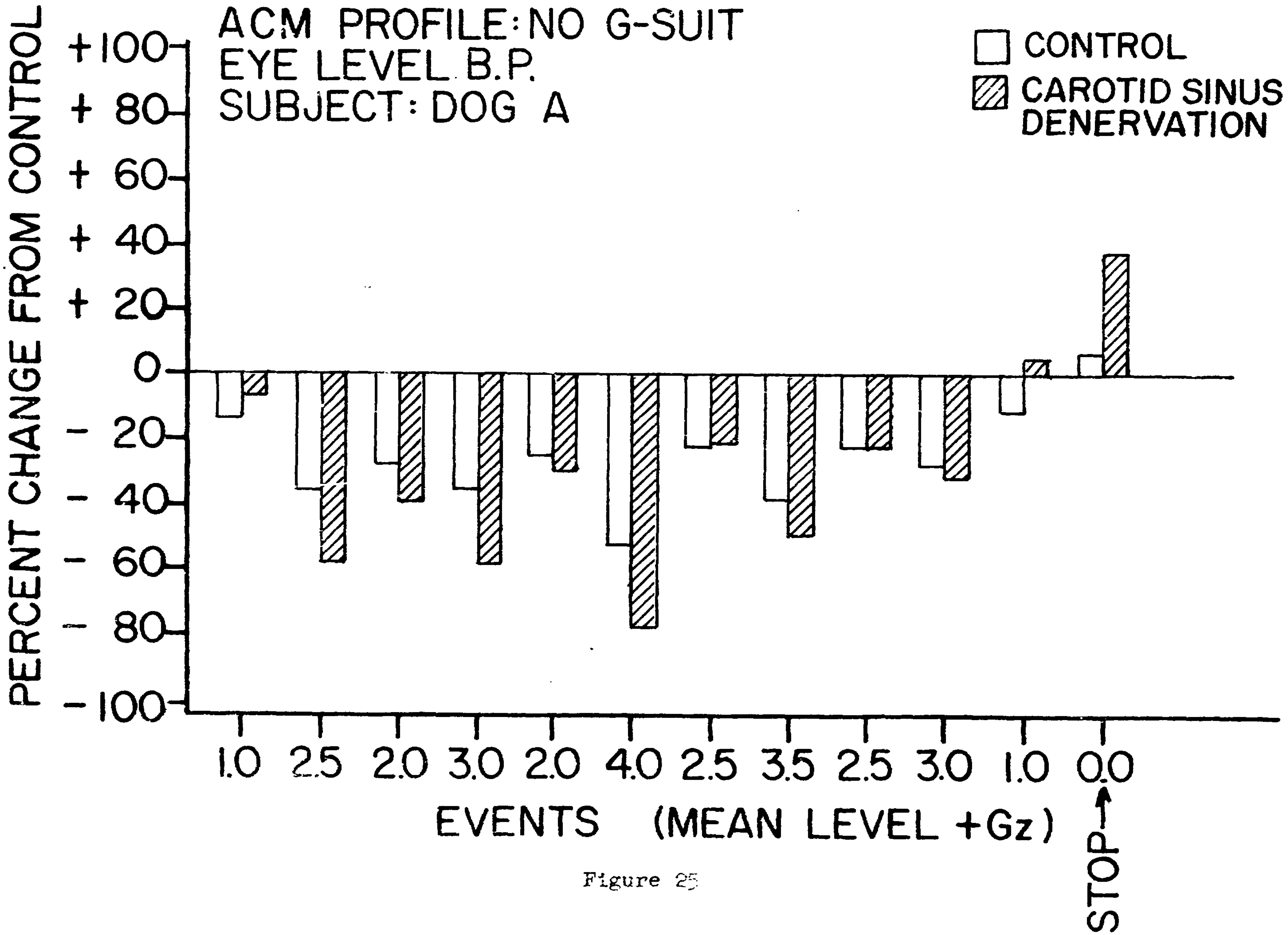
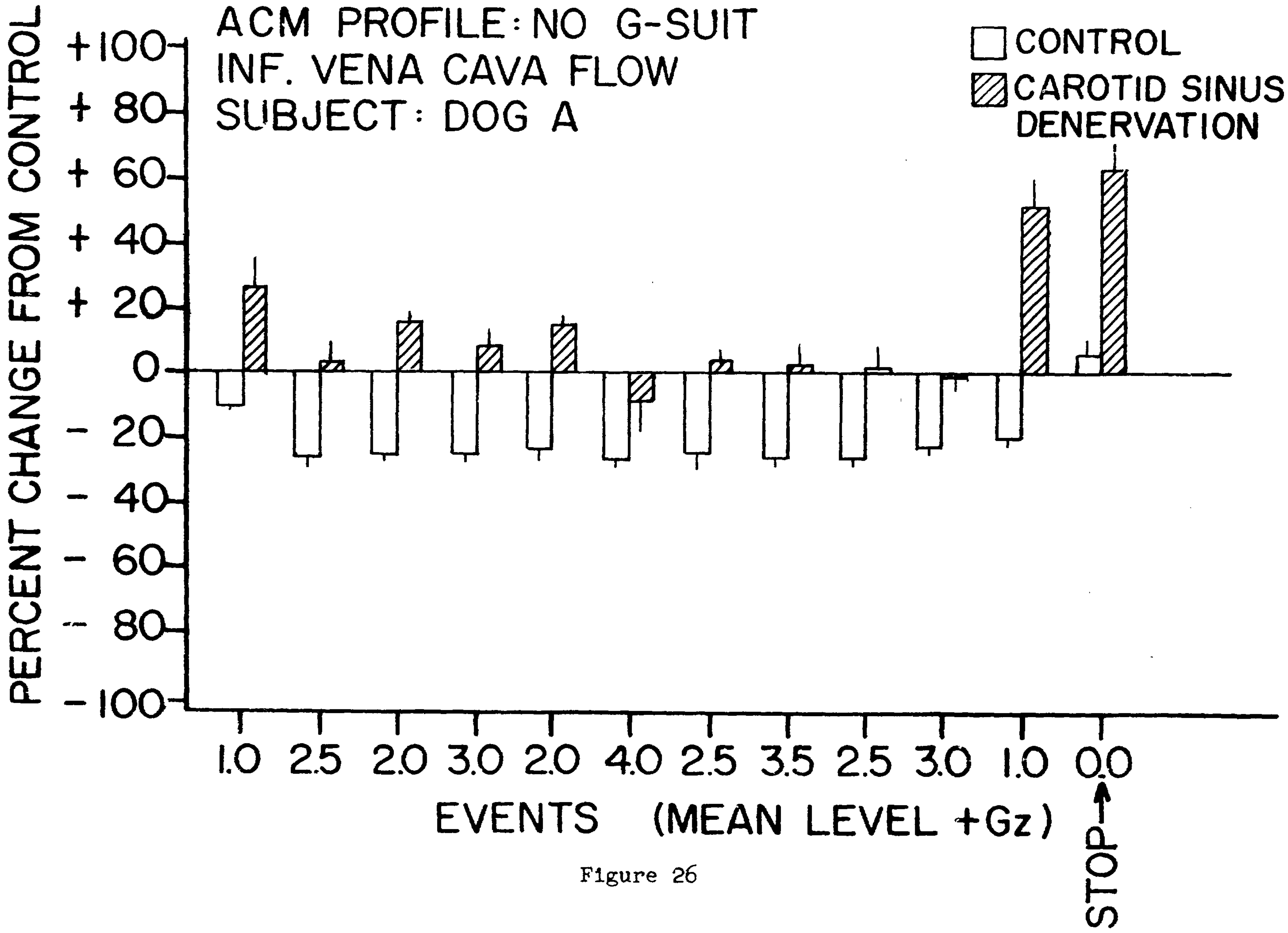

ACM PROFILE: NO G-SUIT
EYE LEVEL B.P.
SUBJECT: DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0
2.5
2.0
3.0
2.0
4.0
2.5
3.5
2.5
3.0
1.0
0.0
STOP
EVENTS (MEAN LEVEL +Gz)

Figure 25



ACM PROFILE: NO G-SUIT
INF. VENA CAVA FLOW
SUBJECT: DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 26

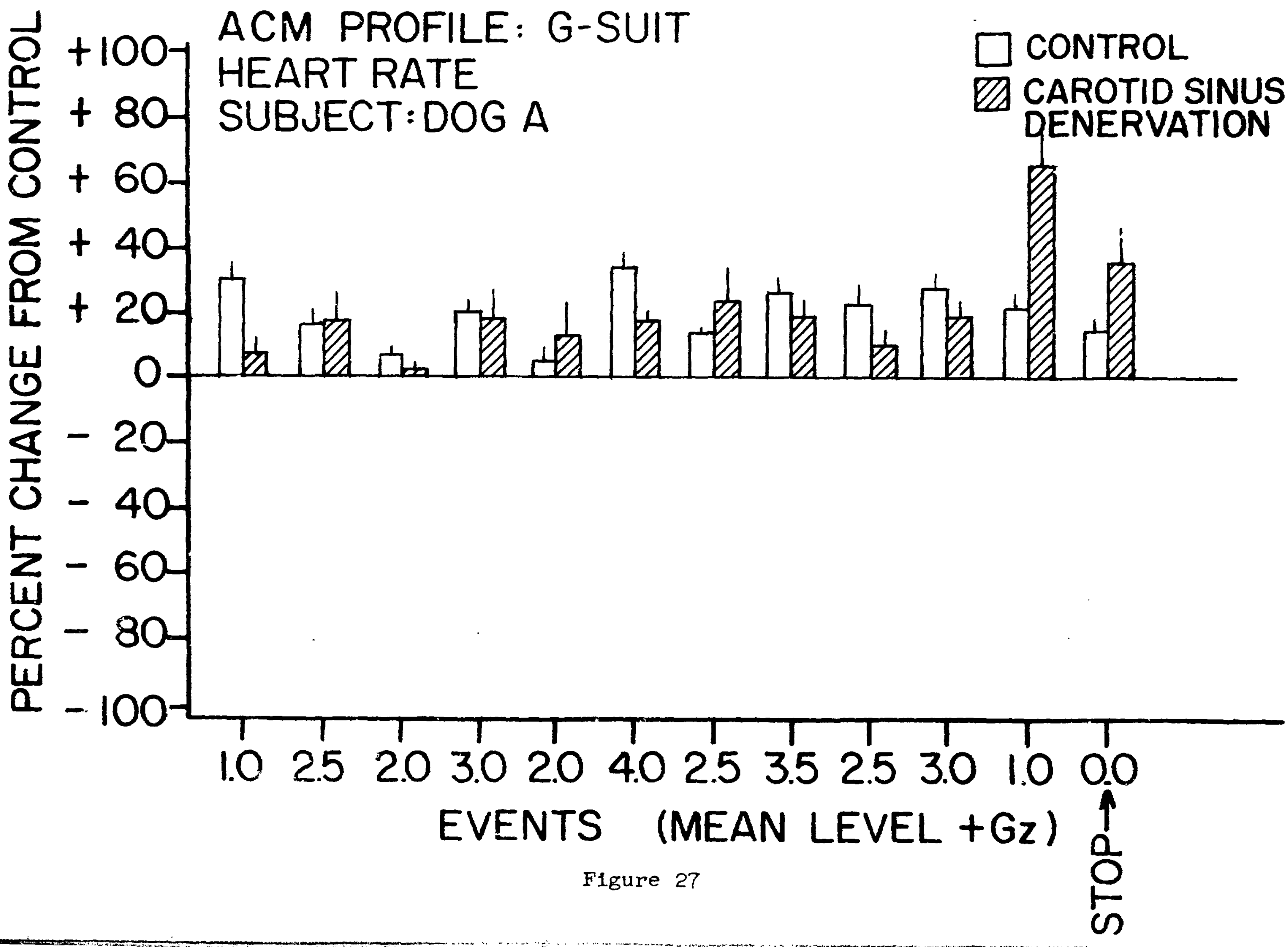

ACM PROFILE: G-SUIT
HEART RATE
SUBJECT: DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
- 100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 27

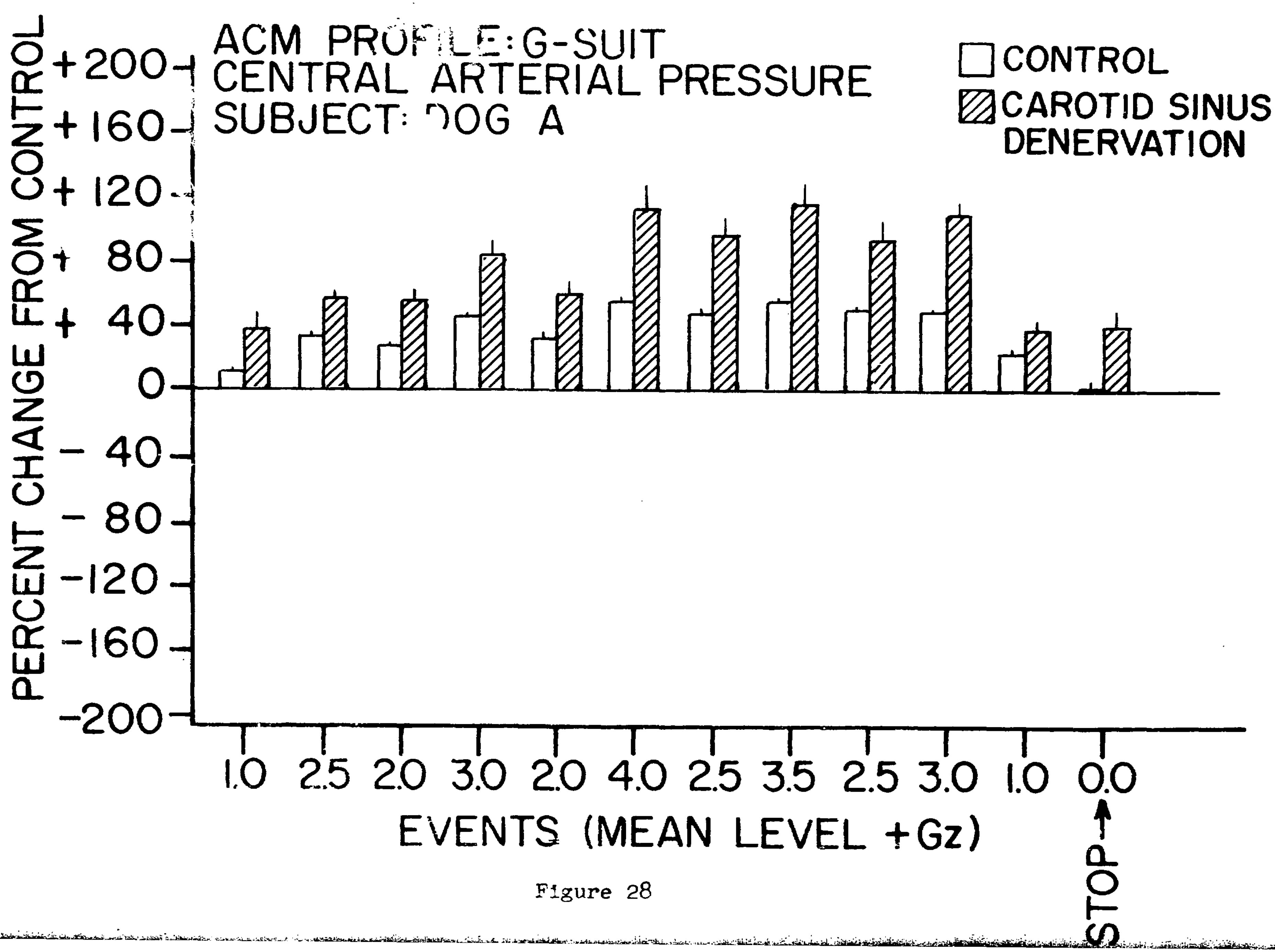
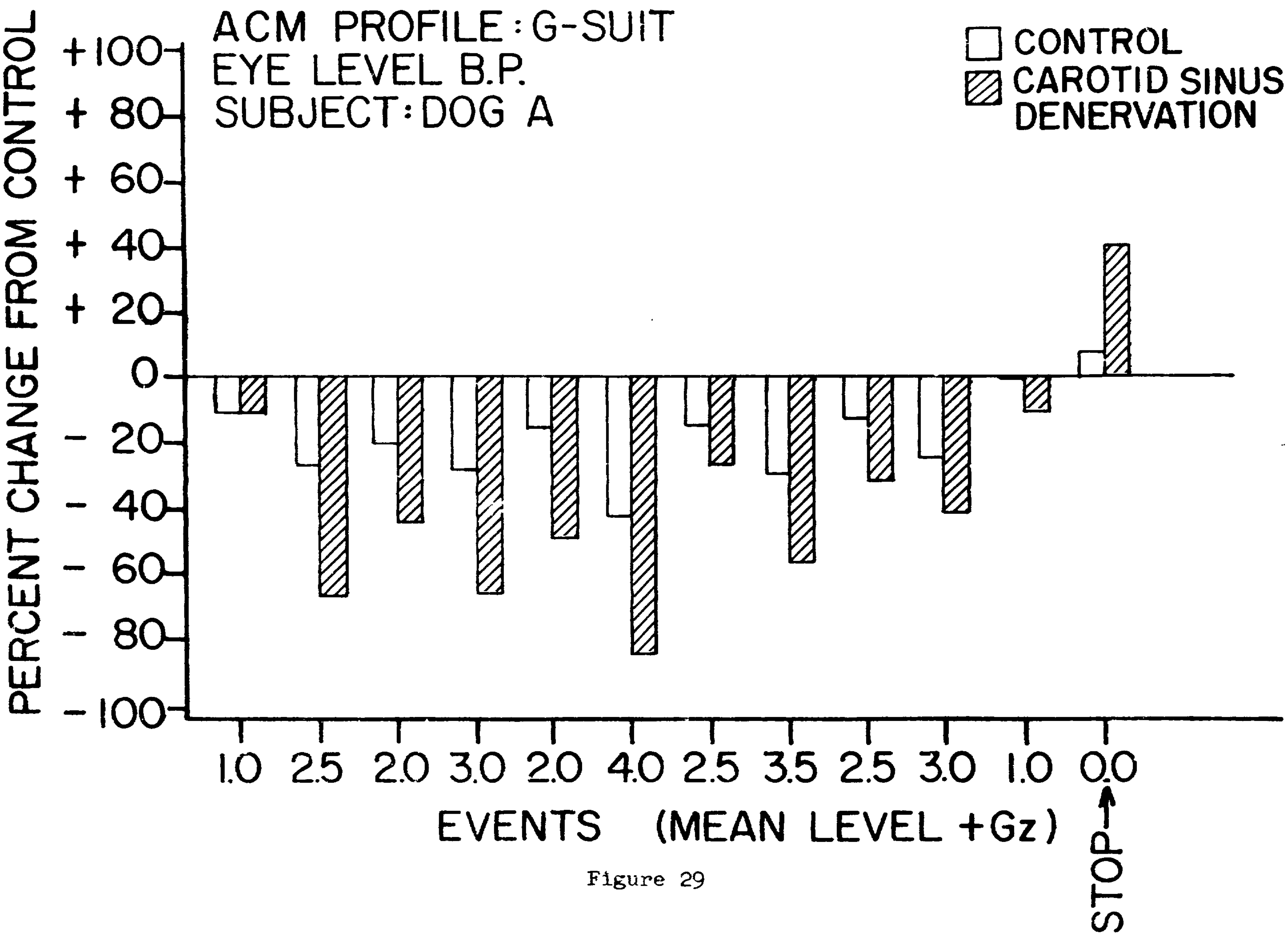

ACM PROFILE: G-SUIT
CENTRAL ARTERIAL PRESSURE
SUBJECT: DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+200
+160
+120
+80
+40
0
-40
-80
-120
-160
-200
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 28



ACM PROFILE: G-SUIT
EYE LEVEL B.P.
SUBJECT: DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
- 100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 29

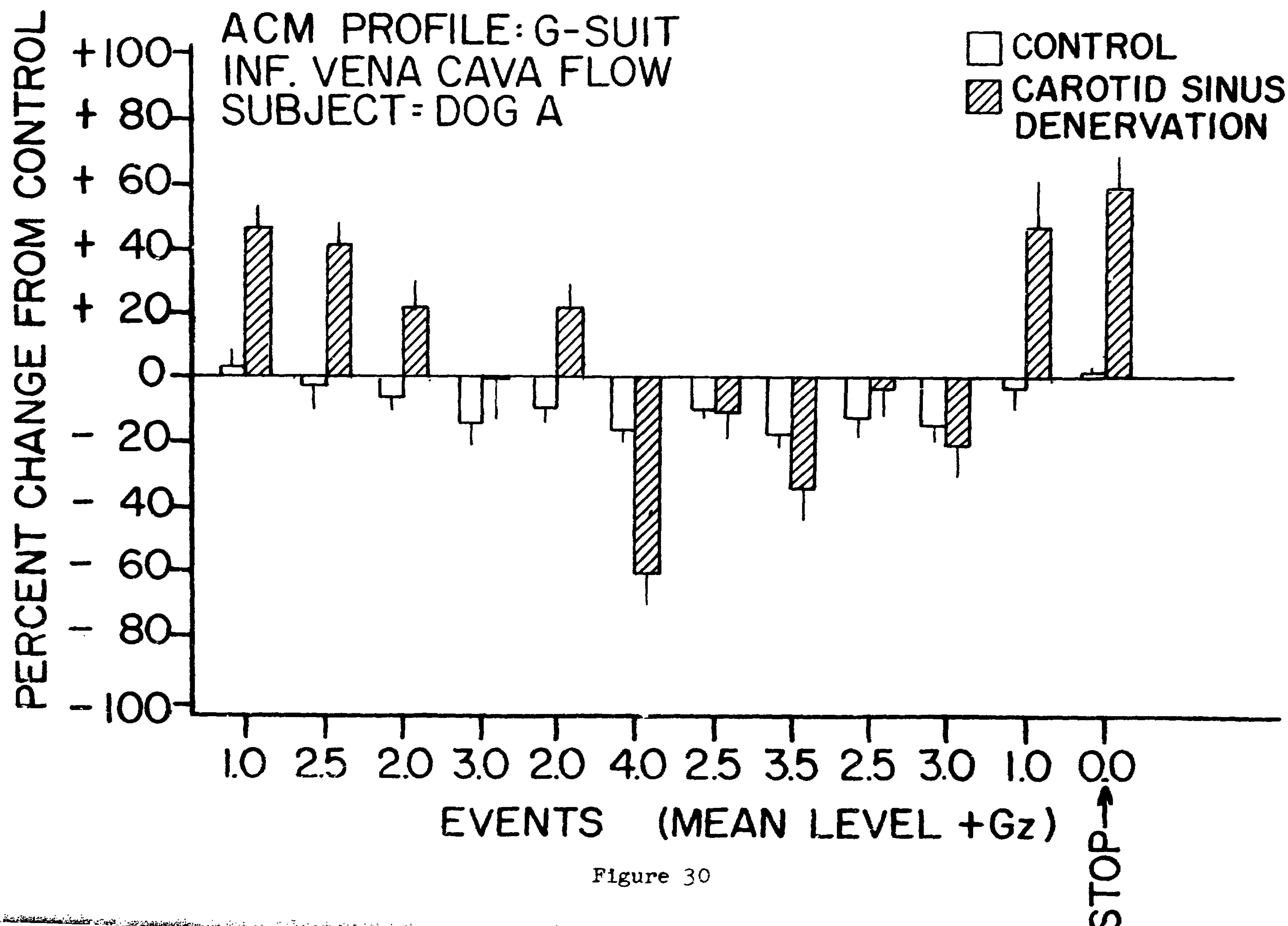
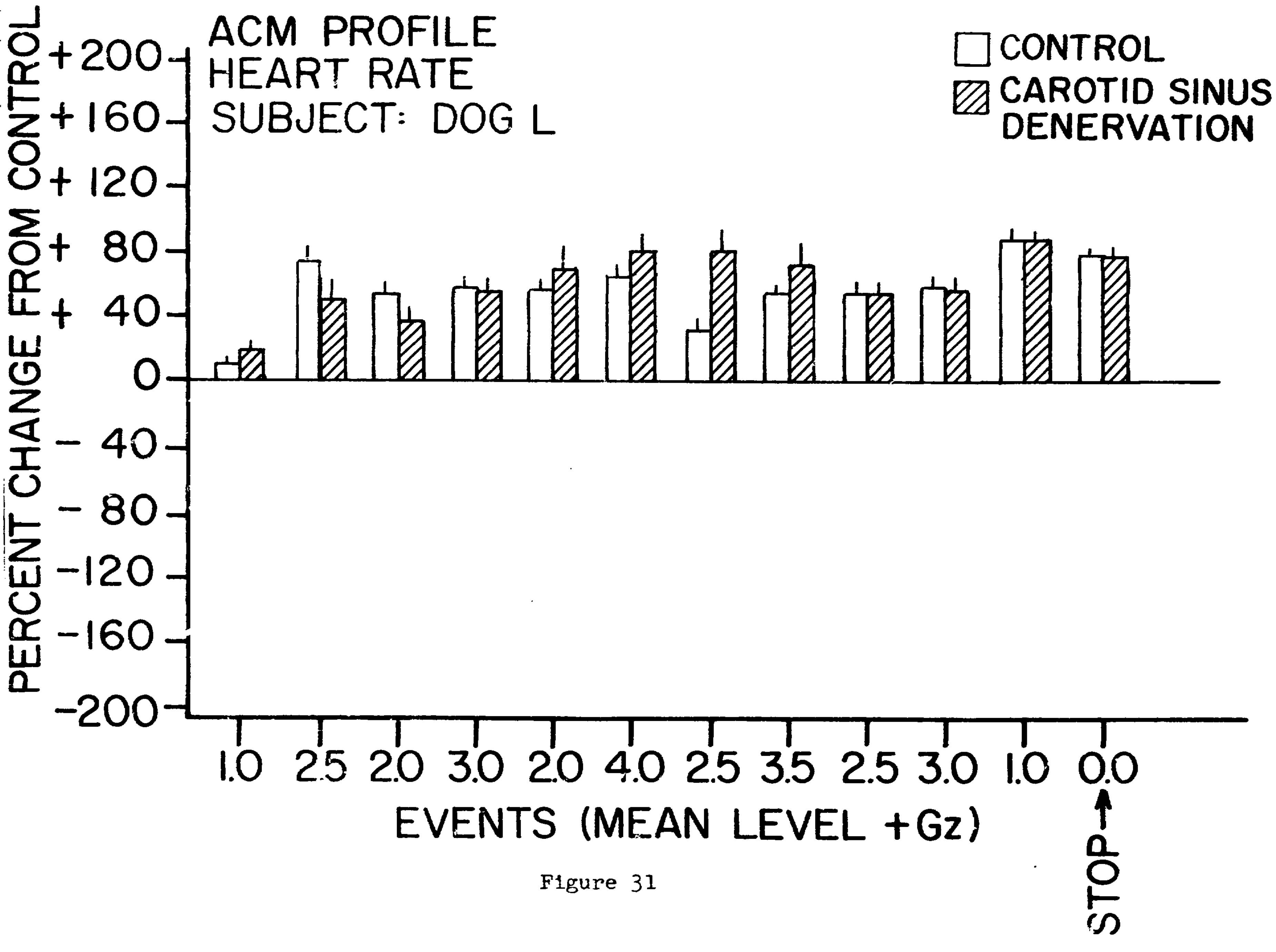

ACM PROFILE: G-SUIT
INF. VENA CAVA FLOW
SUBJECT = DOG A
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+100
+ 80
+ 60
+ 40
+ 20
0
- 20
- 40
- 60
- 80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 30



ACM PROFILE
HEART RATE
SUBJECT: DOG L
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+200
+160
+120
+80
+40
0
-40
-80
-120
-160
-200
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 31

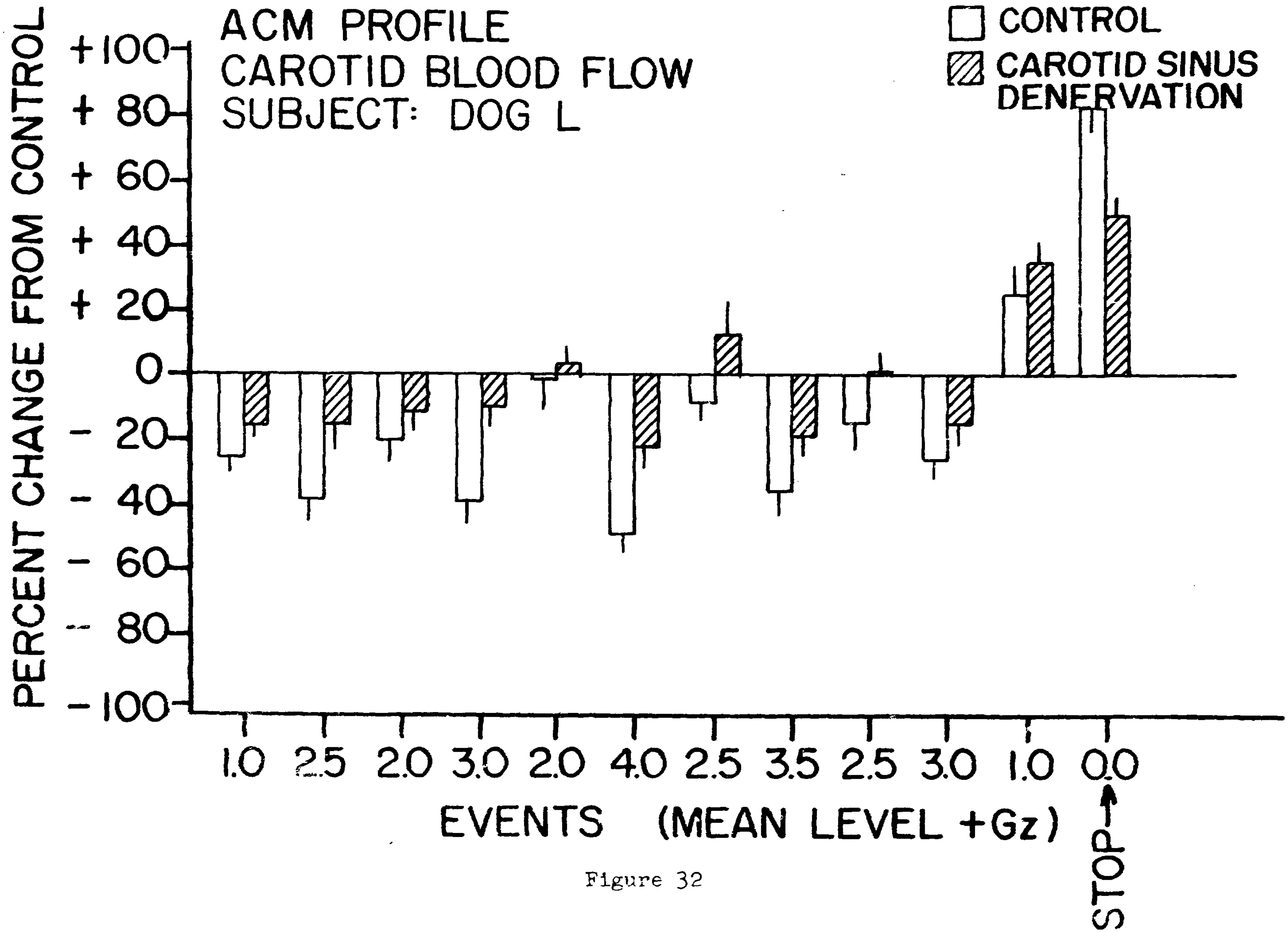

ACM PROFILE
CARROTID BLOOD FLOW
SUBJECT: DOG L
CONTROL
CAROTID SINUS DENERVATION
PERCENT CHANGE FROM CONTROL
+100
+80
+60
+40
+20
0
-20
-40
-60
-80
-100
1.0 2.5 2.0 3.0 2.0 4.0 2.5 3.5 2.5 3.0 1.0 0.0
EVENTS (MEAN LEVEL +Gz)
STOP

Figure 32

TABLE 7

PULSE PROFILE
NO G-SUIT
SUBJECT: DOG A

( ) = $S\bar{x}$

PULSE #		START	MID 1	MIN 1	MID 2	MIN 2	MID 3	MIN 3	MID 4	MIN 4	MID 5	STOP	+10	+20	+30	CONT	n
CAROTID FLOW	CONT	101 (2.5)	44.8 (6.9)	123.3 (13.3)	59.5 (4.1)	146.6 (13.2)	55.3 (5.0)		52.5 (4.9)		54.3 (6.3)	116.8 (13.5)	113.9 (10.5)	99.5 (4.7)	93.4 (5.1)	98.0 (6.8)	14
	C/S DEN																
VENA CAVA FLOW	CONT	106 (2.8)	79.2 (4.5)	123.8 (5.8)	74.0 (3.2)	116.9 (7.0)	68.1 (3.4)	120.5 (5.9)	63.7 (2.4)	121.3 (6.9)	61.5 (3.6)	119.7 (3.5)	93.3 (3.4)	97.6 (4.1)	103.6 (4.7)	98.6 (3.3)	12
	C/S DEN	103.3 (2.6)	125.0 (10.4)	179.4 (11.2)	118.7 (7.9)	169.6 (13.2)	107.8 (8.3)	174.4 (4.9)	125.6 (2.9)	172.0 (12.6)	115.4 (9.5)	164.3 (12.5)	96.0 (12.0)	100.7 (10.7)	104.5 (14.1)	91.8 (5.8)	6
CENTERAL ARTERIAL PRESSURE	CONT	102.4 (0.9)	114.2 (3.7)	122.3 (4.3)	120.6 (4.0)	123.5 (3.7)	125.0 (3.6)	124.7 (2.6)	123.0 (4.2)	124.1 (4.8)	124.2 (4.1)	114.6 (2.3)	102.1 (1.6)	103.3 (1.9)	102.4 (1.7)	102.2 (1.9)	26
	C/S DEN	106.5 (3.2)	146.8 (8.4)	164.5 (4.5)	181.2 (5.5)	170.3 (7.8)	188.6 (12.6)	177.7 (10.7)	187.5 (8.0)	179.5 (8.0)	186.2 (11.1)	139.5 (6.8)	105.3 (6.2)	102.7 (4.7)	101.7 (4.6)	99.3 (5.6)	6
EYE LEVEL PRESSURE	CONT	102	29.2	101.3	35.6	102.5	40.0	103.7	38.0	103.1	39.2	114.6	102.1	103.3	102.4	102.2	26
	C/S DEN	106.5	0	122.5	14.2	128.3	21.6	135.7	20.5	137.5	19.2	139.5	105.3	102.7	101.7	99.3	6
HEART RATE	CONT	107.3 (2.[illegible])	187.1 (8.2)	131.5 (11.2)	174.3 (8.2)	116.8 (10.3)	162.6 (10.4)	105.3 (9.4)	162.5 (9.5)	121.7 (13.7)	175.7 (11.9)	116.9 (5.9)	114.3 (3.8)	110.9 (4.2)	107.7 (3.7)	99.7 (2.9)	27
	C/S DEN	104.2 (4.2)	164.7 (12.2)	110.7 (5.0)	124.0 (4.5)	115.3 (5.3)	144.5 (17.6)	109.3 (7.0)	149.5 (5.9)	117.0 (7.7)	131.5 (6.1)	153.5 (3.5)	123.8 (5.5)	121.7 (2.4)	121.8 (8.7)	98.2 (5.2)	6

TABLE 8

PULSE PROFILE
G-SUIT
SUBJECT: DOG A

( )=$S\bar{x}$

Pulse #		START	MID 1	MIN 1	MID 2	MIN 2	MID 3	MIN 3	MID 4	MIN 4	MID 5	STOP	+10	+20	+30	CONT	n
CAROTID FLOW	CONT	106.6 (5.6)	58.6 (4.0)	121.0 (13.3)	42.1 (9.9)	108.8 (3.2)	40.3 (7.5)	98.0 (6.8)	43.7 (7.4)	103.2 (8.0)	37.1 (8.7)	141.1 (11.5)	135.4 (13.1)	123.1 (9.4)	116.0 (8.8)	110.4 (5.4)	9
	C/S DEN																
VENA CAVA FLOW	CONT	100.2 (4.7)	103.6 (4.0)	131.3 (4.0)	89.8 (2.0)	116.0 (5.0)	90.0 (1.4)	116.0 (2.2)	85.2 (2.8)	115.0 (3.9)	88.6 (1.9)	108.2 (8.8)	86.6 (5.6)	84.6 (7.7)	85.6 (6.7)	96.6 (2.9)	5
	C/S DEN	97.5 (4.5)	95.6 (14.7)	142.8 (11.3)	51.5 (9.4)	108.5 (6.9)	56.8 (8.5)	128 (6.3)	45.8 (8.7)	136.8 (5.4)	87.0 (14.1)	146.8 (14.3)	85 (6.3)	77.2 (3.4)	79.5 (4.6)	80.0 (5.5)	6
CENTRAL ARTERIAL PRESSURE	CONT	102.9 (1.3)	139.6 (3.5)	138.9 (3.0)	153.6 (3.4)	139.7 (1.8)	160.8 (2.8)	140.3 (2.4)	162.1 (2.8)	141.8 (2.8)	160.7 (3.2)	124.1 (3.0)	109.8 (1.7)	102.5 (3.6)	104.3 (2.0)	99.6 (1.7)	14
	C/S DEN	115.3 (4.6)	239.1 (18.1)	220 (18.5)	257.8 (17.1)	213.5 (14.4)	263 (21.1)	218.6 (17.9)	279.5 (22.5)	222.3 (18.0)	287.3 (27.0)	190.0 (14.5)	137.1 (15.5)	118.5 (11.3)	118.6 (10.7)	94.8 (5.3)	6
EYE LEVEL PRESSURE	CONT	102.9	41.6	114.9	55.6	115.7	62.8	116.0	64.1	117.8	62.7	124.1	109.8	102.5	104.3	99.6	14
	C/S DEN	115.3	0	155.7	0.3	149.2	5.5	154.3	22.0	159.0	29.8	190.0	137.1	118.5	118.6	94.8	6
HEART RATE	CONT	99.0 (1.2)	157.0 (7.2)	103.[illegible] (5.[illegible])	136.1 (6.6)	112.2 (6.0)	135.7 (5.1)	112.9 (5.1)	131.0 (3.5)	116.9 (3.9)	131.0 (4.4)	118.9 (3.9)	110.9 (4.7)	107.3 (3.[illegible])	105.1 (3.[illegible])	102.3 (3.6)	14
	C/S DEN	109.5 (7.1)	127.2 (11.0)	119.7 (4.4)	13[illegible] (3.7)	126.7 (6.4)	117.2 (6.8)	124.3 (7.7)	117.8 (5.9)	126.7 (6.4)	122.8 (7.0)	142.1 (6.9)	128.5 (2.8)	120.5 (10.8)	102.3 (2.3)	105.2 (5.9)	6

TABLE 9

PULSE PROFILE
NO G-SUIT
SUBJECT: DOG L

( ) = $S\bar{x}$

PULSE #		START	MID 1	MIN 1	MID 2	MIN 2	MID 3	MIN 3	MID 4	MIN 4	MID 5	STOP	+10	+20	+30	CONT	n
CAROTID FLOW	CONT	77.9 (8.9)	61.4 (7.7)	115.7 (13.6)	63.9 (7.6)	128.5 (17.9)	55.8 (13.8)	106.3 (3.8)	67.8 (8.4)	115.9 (7.9)	65.5 (8.8)	160.8 (22.3)	126.8 (26.0)	135.2 (21.6)	113.8 (12.5)	101.5 (13.2)	3
	C/S DEN	101.5 (2.5)	56.6 (6.6)	86.5 (3.9)	47.5 (5.8)	104.0 (5.9)	40.6 (7.5)	99.5 (4.4)	40.1 (7.5)	106.5 (4.5)	40.0 (6.8)	132.5 (6.4)	126.1 (4.6)	118.5 (3.9)	106.9 (4.4)	105.0 (2.3)	18
VENA CAVA FLOW	CONT	102.9 (1.5)	86.0 (11.5)	74.1 (12.1)	88.6 (7.7)	69.0 (11.8)	96.9 (6.1)	51.3 (8.6)	88.1 (10.5)	59.0 (11.6)	88.5 (8.6)	57.4 (7.7)	71.5 (3.5)	79.7 (3.6)	75.4 (4.6)	95.8 (2.2)	3
	C/S DEN																
CENTERAL ARTERIAL PRESSURE	CONT																
	C/S DEN	96.4 (1.9)	41.6 (5.9)	89.8 (9.3)	116.2 (5.7)	103.0 (3.0)	101.8 (9.7)	100.0 (7.7)	115.4 (7.9)	101.2 (2.0)	126.6 (7.0)	116.6 (7.2)	106.0 (3.3)	97.8 (6.7)	98.2 (1.8)	100.6 (2.6)	18
EYE LEVEL PRESSURE	CONT																
	C/S DEN	96.4	0	33	0	68	0	47	0	65	0	97	106.0	97.8	98.2	100.6	18
HEART RATE	CONT	128.4 (19.3)	177.8 (28.1)	160.2 (38.2)	156.2 (12.9)	171.1 (14.5)	172.2 ([illegible]5)	189.5 (5.3)	225.1 (20.9)	211.8 (10.8)	218.0 (10.8)	163.3 (26.9)	161.5 (5.2)	140.2 (9.8)	148.5 (18.1)	114.0 (8.0)	3
	C/S DEN	96.8 (3.0)	124.8 (7.9)	176.3 (9.7)	168.0 (11.6)	165.5 (10.8)	190.2 (16.7)	166.4 (11.7)	171.0 (14.7)	165.0 (13.9)	163.6 (16.6)	168.6 (10.8)	140.6 (6.5)	122.5 (5.0)	116.1 (5.1)	98.3 (6.4)	18

TABLE 10

PULSE PROFILE
G-SUIT
SUBJECT: DOG L

n=5 ( ) = $S\bar{x}$

Pulse #		START	MID 1	MIN 1	MID 2	MIN 2	MID 3	MIN 3	MID 4	MIN 4	MID 5	STOP	+10	+20	+30	CONT
CAROTID FLOW	CONT															
	C/S DEN	120.7 (10.4)	83.0 (3.0)	135.8 (9.3)	61.0 (4.7)	129.7 (10.5)	68.2 (5.5)	138.2 (8.3)	73.2 (5.9)	133.2 (11.6)	74.3 (3.2)	169.2 (9.0)	144.3 (8.0)	128.0 (8.9)	115.7 (9.1)	96.3 (6.8)
VENA CAVA FLOW	CONT															
	C/S DEN															
CENTERAL ARTERIAL PRESSURE	CONT															
	C/S DEN	113.2 (12.8)	104.5 (17.7)	139.0 (16.0)	137.5 (9.2)	127.0 (4.7)	139.2 (9.2)	128.0 (5.8)	143.2 (8.9)	145.0 (10.3)	140.0 (8.1)	129.7 (8.4)	131.0 (9.6)	122.8 (7.2)	119.2 (7.6)	106.0 (7.4)
EYE LEVEL PRESSURE	CONT															
	C/S DEN	113.2	0	104	9.5	92	11.2	93	15.2	110.0	12.0	129.7	131	122.8	119.2	106
HEART RATE	CONT															
	C/S DEN	110.0 (4.2)	165.0 (9.2)	141.0 (10.2)	136.5 (16.9)	140.0 (11.5)	154.0 (17.9)	164.0 (12.8)	175.2 (17.4)	177.0 (16.5)	172.0 (16.2)	167.0 (18.9)	119.2 (7.8)	116.7 (4.5)	106.7 (7.7)	96.0 (3.3)

TABLE II

PULSE PROFILE
NO G-SUIT
SUBJECT: DOG D

n=2

PULSE #		START	MID 1	MIN 1	MID 2	MIN 2	MID 3	MIN 3	MID 4	MIN 4	MID 5	STOP	+ 10	+ 20	+30	CONT
CAROTID FLOW	CONT	72.0	49.5	84.5	58.5	93.5	49.5	93.0	49.5	93.0	44.5	108.0	97.0	88.0	97.0	85.0
	C/S DEN															
VENA CAVA FLOW	CONT															
	C/S DEN															
CENTRAL ARTERIAL PRESSURE	CONT	81.5	64.5	85.0	145.0	116.5	125.0	116.0	142.5	119.0	152.0	115.0	76.0	72.0	104.0	116.5
	C/S DEN															
EYE LEVEL PRESSURE	CONT	100	0	50.7	32.0	86.7	17.0	93.7	39.0	86.7	46.0	115.0	76.0	72.0	104.0	116.5
	C/S DEN															
HEART RATE	CONT	100.0	100.0	200.0	175.0	200.0	143.8	196.0	129.3	200.0	131.3	196.0	112.8	123.0	137.5	111.0
	C/S DEN															

TABLE 12

PULSE PROFILE
NO G-SUIT
SUBJECT: DOG M

( )= $S\bar{x}$

PULSE #		START	MID 1	MIN 1	MID 2	MIN 2	MID 3	MIN 3	MID 4	MIN 4	MID 5	STOP	+10	+20	+30	CONT	n
CAROTID FLOW	CONT																
	C/S DEN																
VENA CAVA FLOW	CONT																
	C/S DEN																
CENTERAL ARTERIAL PRESSURE	CONT		38.7 (8.8)	86.7 (5.5)	67.0 (3.6)	97.7 (5.2)	65.0 (7.8)	99.3 (11.0)	66.7 (5.5)	97.7 (7.5)	67.3 (1.7)	91.0 (2.1)	89.3 (3.5)	92.7 (6.4)	94.3 (3.5)	99.3 (6.4)	4
	C/S DEN																
EYE LEVEL PRESSURE	CONT		0	51.7	10.0	62.7	8.0	64.3	10.0	62.7	10.0	91	89.3	92.7	94.3	99.3	4
	C/S DEN																
HEART RATE	CONT		209.0 (16.5)	[illegible] (22.[illegible])	170.0 (11.0)	146.0 (11.1)	168.3 (12.2)	147.0 (6.0)	158.0 (17.6)	151.3 (12.0)	142.3 (19.8)	136.0 (9.0)	1[illegible]4.7 (7.4)	138.[illegible] (9.7)	123.7 (9.7)	106.3 (15.5)	4
	C/S DEN																

TABLE 13

SUSTAINED PROFILE
NO G-SUIT
SUBJECT= DOG A

( )=$S\bar{x}$

TIME		T_o	$d\bar{G}=0$	T_o+10''	+.5'	+1'	+1.5'	+2'	+2.5'	STOP	+10	+20	+30	CONT		n
CAROTID FLOW	CONT	101.5 (1.2)	40.5 (8.3)	36.1 (8.0)	54.3 (5.7)	59.3 (5.9)	61.1 (4.7)	59.7 (6.9)	56.5 (8.2)	125.0 (6.7)	125.3 (6.7)	122.5 (6.1)	111.5 (4.7)	107.4 (6.4)		17
	C/S DEN															
VENA CAVA FLOW	CONT	101.1 (3.2)	95.9 (4.4)	104.9 (6.9)	87.6 (6.2)	95.4 (4.8)	100.4 (5.2)	106.1 (8.9)	103.9 (6.6)	97.4 (6.7)	100.4 (5.6)	103.3 (5.6)	106.2 (8.6)	95.4 (5.2)		7
	C/S DEN	96.4 (1.3)	96.0 (1.6)	93.2 (2.7)	99.6 (2.4)	98.5 (2.8)	96.4 (2.0)	99.5 (2.3)	98.4 (1.9)	98.4 (3.4)	98.6 (2.0)	100.4 (2.2)	98.6 (2.2)	99.7 (1.4)		9
CENTERAL ARTERIAL PRESSURE	CONT	101.7 (0.9)	107.5 (4.2)	129.5 (7.1)	141.5 (6.4)	150.6 (7.8)	151.[illegible] (6.4)	152.5 (5.6)	144.5 (3.4)	112.6 (2.9)	104.9 (1.4)	103.2 (1.2)	102.8 (1.9)	104.6 (2.9)		25
	C/S DEN	100.8 (1.3)	111.2 (4.4)	135.5 (7.2)	163.4 (4.0)	176.9 (5.4)	181.4 (3.5)	190.6 (4.4)	201.7 (4.8)	166.7 (5.3)	106.9 (4.1)	110.5 (3.1)	111.7 (3.4)	103.3 (4.6)		10
EYE LEVEL PRESSURE	CONT	101.7	47.0	69.0	81.0	90.1	91.3	92.0	84.0	112.6	104.9	103.2	102.8	104.6		25
	C/S	100.8	10.8	35.1	63.0	76.5	81.0	90.2	101.3	166.7	106.9	110.5	111.7	103.3		10
HEART RATE	CONT	104.9 (2.1)	180.9 (4.8)	190.1 (5.[illegible])	153.7 (6.8)	138.0 (6.3)	143.1 (6.6)	151.2 (6.3)	146.4 (7.0)	145.1 (4.5)	132.9 (3.7)	126.7 (3.1)	121.0 (3.9)	110.0 (3.2)		25
	C/S	105.4 (3.4)	160.4 (5.5)	[illegible] (6.3)	126.2 (7.7)	119.0 (6.4)	128.5 (6.7)	123.7 (5.6)	123.6 (6.[illegible])	157.[illegible] (4.[illegible])	148.9 (7.9)	125.2 (7.[illegible])	122.2 (5.5)	103.3 (4.3)		10

TABLE 14

SUSTAINED PROFILE

G-SUIT

SUBJECT: DOG A

( )=$S\bar{x}$

		To	$d\bar{G}=0$	T_0+10"	+.5'	+1'	+1.5'	+2'	+2.5	Stop	+10	+20	+30	Cont		n
CAROTID FLOW	CONT	100	70.7 (2.7)	68.3 (4.4)	72.2 (5.7)	60.2 (6.2)	59.3 (5.1)	58.8 (4.5)	66.8 (4.5)	122.0 (4.0)	112.5 (4.4)	100.5 (6.1)	101.3 (6.7)	93.8 (6.2)		5
	C/S DEN															
VENA CAVA FLOW	CONT	98.4 (3.3)	107.0 (4.8)	108.2 (1.3)	99.6 (3.1)	97.4 (2.9)	96.2 (3.7)	108.4 (3.0)	101.0 (5.6)	91.6 (5.9)	81.6 (1.8)	78.4 (3.4)	84.0 (3.7)	101.3 (1.3)		5
	C/S DEN	99.7 (3.4)	126.4 (7.2)	146.9 (15.1)	104.0 (4.7)	111.7 (6.4)	98.3 (3.7)	94.3 (7.0)	110.0 (10.5)	192.3 (8.3)	105.3 (3.7)	114.8 (8.7)	114.8 (3.5)	96.5 (5.6)		8
CENTERAL ARTERIAL PRESSURE	CONT	99.9 (0.6)	114.5 (3.1)	129.1 (4.0)	138.6 (2.9)	142 (2.8)	145.3 (3.3)	141.0 (3.7)	145.0 (2.4)	113.0 (1.8)	106.4 (1.8)	104.9 (1.4)	104.6 (1.6)	99.8 (2.6)		10
	C/S DEN	103.3 (3.5)	139.9 (5.9)	165.7 (7.7)	186.4 (7.6)	196.3 (12.1)	204.8 (8.5)	202.3 (7.4)	213.8 (5.2)	156.8 (10.6)	119.2 (3.8)	111.4 (7.5)	112.6 (6.7)	103.0 (2.9)		8
EYE LEVEL PRESSURE	CONT	99.9	53.5	68.1	77.6	81.0	94.3	80.0	94.0	113.0	106.4	104.9	104.6	99.8		10
	C/S DEN	103.3	10.8	36.5	57.3	67.2	75.7	73.2	84.7	156.8	119.2	111.4	112.6	103		8
HEART RATE	CONT	103.7 (2.3)	140.7 (8.7)	147.[illegible] (12.2)	123.7 (3.8)	116.5 (4.7)	113.1 (4.6)	117.5 (5.5)	119.[illegible] (3.7)	116.6 (6.2)	115.5 (7.4)	104.5 (4.3)	103.9 (4.[illegible])	[illegible] (6.0)		10
	C/S DEN	109.1 (4.5)	143.0 (8.2)	107.4 (3.5)	98.3 (1.7)	106.3 (4.3)	10[illegible] (8.7)	104.1 (4.2)	120.2 (8.4)	145.0 (5.0)	115.0 (10.0)	102.[illegible] (2.6)	105.1 (2.9)	98.0 (2.0)		8

TABLE 15

SUSTAINED PROFILE
NO G-SUIT
SUBJECT=. DOG L

( )=S $\bar{x}$

Time		To	$d\bar{G}=0$	To+10'	+.5'	+1'	+1.5'	+2'	+2.5'	STOP	+10	+20	+30	CONT		n
CAROTID FLOW	CONT	92.4 (3.7)	48.7 (4.6)	59.9 (2.9)	66.7 (4.2)	76.3 (4.7)	72.2 (5.7)	74.3 (4.9)	76.0 (3.4)	137.0 (6.3)	134.3 (6.1)	129.0 (5.5)	129.8 (7.7)	100.8 (4.1)		22
	C/S DEN	107.0 (3.5)	69.9 (5.5)	63.9 (4.3)	73.2 (3.2)	74.0 (5.1)	73.4 (4.8)	76.7 (4.7)	72.2 (6.0)	139.8 (6.0)	146.2 (5.1)	135.4 (5.4)	131.6 (4.6)	102.[illegible] (3.0)		34
VENA CAVA FLOW	CONT	99.1 (1.0)	91.2 (2.7)	92.1 (3.3)	97.6 (0.9)	96.7 (1.3)	100.0 (0.9)	101.5 (5.7)	99.6 (1.0)	121.8 (3.8)	116.0 (2.8)	110.6 (1.5)	108.5 (1.3)	97.8 (0.[illegible])		22
	C/S DEN															
CENTRAL ARTERIAL PRESSURE	CONT															
	C/S DEN	104.2 (4.4)	92.8 (5.3)	87.1 (6.9)	115.1 (5.1)	126.0 (5.4)	137.1 (4.5)	150.7 (6.2)	130.6 (6.3)	126.8 (5.4)	119.9 (3.9)	116.2 (2.3)	116.3 (3.2)	103.0 (2.8)		34
EYE LEVEL PRESSURE	CONT															
	C/S DEN	104.2	3.8	0.0	26.1	37.0	48.5	61.7	50.6	126.8	119.9	116.2	116.3	103.0		34
HEART RATE	CONT	10[illegible].0 (3.[illegible])	166.9 (10.5)	151.[illegible] (12.[illegible])	138.[illegible] (10.9)	147.4 (9.1)	140.3 (5.5)	124.0 (5.4)	122.6 (5.8)	156.1 (5.7)	159.4 (6.7)	134.9 (4.0)	132.[illegible] (5.2)	94.9 (2.4)		22
	C/S DEN	104.0 (2.6)	149.2 (6.1)	151.9 (6.1)	168.5 (6.2)	151.0 (5.5)	140.9 (6.5)	131.4 (6.5)	135.6 (4.8)	157.[illegible] (4.[illegible])	145.2 (5.0)	130.[illegible] (3.8)	127.1 (4.7)	94.8 (4.6)		34

TABLE 16

SUSTAINED PROFILE

G-SUIT

SUBJECT: DOG L

( ) = $S\bar{x}$

Time		To	dG=0	To+10	+.5'	+1'	+1.5"	+2'	+2.5'	Stop	+10	+20	+30	Cont	n
CAROTID FLOW	CONT														
	C/S DEN	121.0 (9.8)	73.3 (6.4)	71.7 (7.0)	90.5 (7.0)	95.0 (4.2)	95.8 (4.2)	101.3 (5.3)	94.3 ([illegible].0)	128.3 (9.0)	135.2 (8.4)	125.2 (7.9)	114.3 (7.1)	96.7 (5.7)	6
VENA CAVA FLOW	CONT														
	C/S DEN														
CENTERAL ARTERIAL PRESSURE	CONT														
	C/S DEN	100.2 (5.2)	100.8 (9.0)	110.3 (8.0)	133.3 (5.7)	136.0 (2.9)	147.0 (5.6)	145.3 (4.4)	144.1 (8.4)	115.3 (6.7)	108.2 (2.3)	97.3 (1.9)	99.3 (3.5)	97.7 (3.9)	6
EYE LEVEL PRESSURE	CONT														
	C/S DEN	100.2	11.8	21.3	44.3	47.0	58.0	56.3	55.7	115.3	108.2	97.3	99.3	97.7	6
HEART RATE	CONT														
	C/S DEN	118.3 (2.2)	130.0 (4.6)	162.8 (15.5)	140.0 (14.0)	139.8 (9.2)	119.2 (5.8)	130.5 (10.1)	152.8 (17.4)	162.8 (10.2)	147.7 (12.9)	137.0 ([illegible])	105.3 (2.8)	100.7 (4.8)	6

TABLE 1

SUSTAINED PROFILE
NO G-SUIT
SUBJECT= DOG D

( )= $S\bar{x}$

Time		To	$d\bar{G}=0$	To+10"	+5'	+1'	+1.5'	+2'	+2.5'	STOP	+10	+20	+30	CONT		n
CAROTID FLOW	CONT	101.8 (1.8)	83.6 (7.0)	82.9 (6.9)	102.6 (10.8)	108.2 (11.9)	126.4 (11.8)	114.9 (9.8)	131.6 (13.3)	230.5 (18.4)	200.7 (19.7)	196.0 (23.8)	165.3 (20.5)	122.8 (21.0)		7
	C/S DEN															
VENA CAVA FLOW	CONT															
	C/S DEN															
CENTERAL ARTERIAL PRESSURE	CONT	100.0 (.07)	98.3 (14.4)	98.5 (14.0)	90.5 (11.7)	92.0 (8.4)	100.0 (10.0)	89.9 (12.0)	87.0 (4.0)	90.0 (10.8)	90.3 (8.8)	92.8 (7.1)	95.8 (10.0)	105.4 (16.8)		7
	C/S DEN															
EYE LEVEL PRESSURE	CONT	100	26.2	26.5	18.5	19.9	27.9	17.8	13.8	90.0	90.3	92.8	95.8	105.4		7
	C/S DEN															
HEART RATE	CONT	103.6 (3.6)	210.9 (25.4)	218.7 (20.8)	211.3 (19.1)	212.3 (17.6)	205.6 (17.8)	204.3 (18.3)	203.6 (19.4)	146.4 (16.7)	133.4 (14.3)	115.0 (11.9)	91.0 (6.5)	101.6 (14.0)		7
	C/S DEN															

TABLE [illegible]

SUSTAINED [illegible] OFILE

NO G-SUIT

SUBJECT= DOG M

( )= $S\bar{x}$

TIME		To	$d\bar{G}$=0	To+10"	+.5'	+1'	+1.5'	+2'	+2.5'	STOP	+10	+20	+30	CONT		n
CAROTID FLOW	CONT															
	C/S DEN															
VENA CAVA FLOW	CONT															
	C/S DEN															
CENTERAL ARTERIAL PRESSURE	CONT	95.5 (2.2)	79.2 (10.7)	92.5 (10.5)	154.5 (19.6)	182.7 (20.5)	188.0 (21.9)	201.0 (13.4)	193.2 (13.3)	134.2 (9.1)	96.2 (5.9)	110.3 (4.6)	116.3 (4.0)	101.4 (4.4)		6
	C/S DEN															
EYE LEVEL PRESSURE	CONT	95.5	0	0	20.5	48.7	54.0	67.0	59.2	134.2	96.2	110.3	116.3	101.4		6
	C/S DEN															
HEART RATE	CONT	101.7 (1.7)	186.5 (10.0)	187.8 (8.8)	169.2 (15.4)	136.3 (10.1)	140.0 (11.0)	116.0 (7.4)	139.7 (12.1)	144.5 (6.1)	151.5 (8.4)	123.7 (3.7)	132.0 (5.1)	109.2 (4.9)		6
	C/S DEN															

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